RESTORATION ADVISORY BOARD MEETING
NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP), BETHPAGE
TOWN OF OYSTER BAY, BETHPAGE COMMUNITY CENTER
103 GRUMMAN ROAD WEST, BETHPAGE, NEW YORK
WEDNESDAY, APRIL 18, 2018

The Forty-second (42nd) meeting of the Restoration Advisory Board (RAB) was held at the Bethpage Community Center in Bethpage, New York. Meeting attendees included representatives from the Navy (Jeffrey Doepp, Lora Fly, Melissa Forrest, JC Kreidel, Joe McCloud, and Brian Murray), The Management Edge (Gayle Waldron), New York State Department of Environmental Conservation (NYSDEC) (Martin Brand, Don Hesler, Walter Parish, Jason Pelton, Steve Scharf, and John Swartwout), New York State Department of Health (NYSDOH) (Steve Karpinski, Min-Sook Kim, and Dakota Tarbell), Nassau County Department of Health (NCDOH) (John Lovejoy), Hempstead Water District (John Reinhardt), Bethpage Water District (BWD) (Teri Black, Michael Boufis, John Coumatos, Sal Greco, and John Sullivan), Massapequa Water District (MWD) (Raymond Averna, Stan Carey, and Joseph Tricarico), South Farmingdale Water District (SFWD) (Gary Brosnan), KOMAN Government Solutions, LLC (Greg Pearman), Tetra Tech (David Brayack, Melissa Cushing, and Kristi Francisco), Nassau County Legislature (Laura Schaefer and Rose Walker), New York Senate (Alyssa Meano), Town of Oyster Bay (Rich Lenz), and Resolution Consultants (Brian Caldwell, Vincent Varricchio, Eleanor Vivaudou, and Michael Zobel). RAB members in attendance were Sandra D'Arcangelo, Robert Horan, Edward Olmstead, Bill Pavone, David Sobolow, and Rose Walker. There were approximately 26 residents from Bethpage and neighboring towns in attendance. A local newspaper and television news were also in attendance. The meeting sign-in sheet is provided as Appendix A. The Agenda and Definitions are provided in Appendix B.

OPEN HOUSE SESSION

Prior to the start of the meeting, an open house session was held. The public was invited to peruse the information provided and ask questions to the Navy representatives, contractors, and regulators. A copy of the posters displayed during the open house is presented in Appendix C.

WELCOME AND AGENDA REVIEW

The Navy representative, Ms. Fly, welcomed everyone to the RAB meeting and presented the meeting agenda. In addition, Ms. Fly reviewed the background on the NWIRP Bethpage facility, and gave a brief update on the status of the operable units (OUs), the treatment systems, wellhead treatment at the water districts, and the radium report. Ms. Fly then introduced Ms. Waldron (The Management Edge, serving the role

of facilitator in support of the RAB) who then went over the Rules of Conduct to ensure that everyone is allowed the opportunity to comment. Ms. Waldron introduced Mr. Sobolow, the RAB co-chair, Mr. Murray (Navy representative), Mr. Caldwell (Resolution) and Mr. Brayack (Tetra Tech).

OPERABLE UNIT (OU) 2 - OFFSITE GROUNDWATER INVESTIGATION AND WELL RECOVERY EFFECTIVENESS ANALYSES UPDATE

Safe Drinking Water for residents:
Mr. Caldwell, Resolution Consultants, presented slides explaining the steps to take to ensure that the water is safe to drink. Mr. Caldwell reviewed the groundwater cycle and how the raw groundwater is tested and treated by the water districts before it is delivered to the home. The treated groundwater meets all Safe Drinking Water Act requirements before it is distributed.

OU2 Offsite Groundwater Investigation:
Mr. Caldwell presented the offsite groundwater program objectives. Mr. Caldwell reviewed the local groundwater geology and its applicability to the plume, and presented the vertical profile borings (VPBs) and groundwater wells that have been installed and sampled since 2009. He described work performed since the last RAB meeting, future work to be implemented, and recent reports with their respective results. Mr. Caldwell reviewed the recent trends in RE108 Area Hotspot groundwater from quarterly groundwater sampling and provided an update for the South Farmingdale Water District and New York American Water (NYAW) Well Recovery Evaluation Analysis. The presentation is included in Appendix D.

VPB and Well Installations:
Work performed since November 2018 includes: installation of three monitoring wells (two monitoring wells associated with VPB166, located south of Hempstead Turnpike, and one monitoring well associated with VPB150, located south of Hempstead Turnpike), installation of one VPB (VPB168), two rounds of quarterly groundwater sampling, and two rounds of water level measurements. The results of the recently installed VPB and the quarterly groundwater sampling results were also presented. Anticipated work through March 2019 includes: installation of seven additional VPBs (four north of Hempstead Turnpike Area and three north of Southern State Parkway Area) and eleven monitoring wells (seven north of Hempstead Turnpike and four north of Southern State Parkway), and continued quarterly groundwater sampling.

Recent Trends in RE108 Hotspot:
Quarterly sampling results were presented on trend graphs inside the RE108 Area Hotspot area groundwater for various monitoring wells. Future objectives include the protection of public water supply wells, continued characterization of the OU2 plume, and well recovery evaluation analysis.

Well Recovery Evaluation Update:
The purpose of work is to identify the well recovery zones of the South Farmingdale Water District (SFWD) Plant 6 wells and the NYAW wells. Between February 2017 and May 2017 - water level changes were recorded in key wells south of Hempstead Turnpike. Assuming receipt of requested pumping data from these water districts, groundwater modeling is expected to be completed in the fall of 2018.

GM38 AREA HOTSPOT TREATMENT SYSTEM- RECHARGE BASIN REHABILITATION AND INJECTION WELL TESTING

Mr. Brayack, Tetra Tech, discussed the GM38 Area Hotspot treatment system basin scraping project and injection well testing. The presentation is included in Appendix D.

GM38 Area Hotspot Treatment System Basin Scraping:
The GM38 Treatment System Basin Scraping was conducted from January 19, 2018 to March 9, 2018. As a result of the scraping/dredging, the basin continues to infiltrate 1.4 million gallons per day (MGD) of treated groundwater the treatment system extracts, treats and discharges.

GM38 Area Hotspot Treatment System Injection Well Testing:
While the basin was being scraped, the Navy evaluated the use of an existing injection well (IW 01) for discharge of treated water. The injection rate decreased during testing and redevelopment is planned for Spring 2018 in order to conduct another injection test, also planned for Spring 2018.

RE108 AREA HOTSPOT TREATMENT SYSTEM

Mr. Brayack, Tetra Tech, provided an update on the RE108 Area Hotspot investigation and remediation. The presentation is included in Appendix D.

Phase I RE108 Area Hotspot Treatment System Update:
Mr. Brayack reviewed the Phase I status and also provided a timeline for system design. This included the Phase I 30 percent design completed in October 2017. The Phase I system will include an extraction well and double wall piping from the RE108 hotspot to the Navy's existing GM38 Area Hotspot Treatment System. The existing Nassau County (NC) 495 Recharge Basin currently being used for GM38 discharge will also be utilized for the Phase I RE108 Hotspot discharge.

Phase II RE108 Area Hotspot Treatment System Update:
Mr. Brayack reviewed the Phase II status and also provided a timeline for system design. This included the Phase II 30 percent design to be completed in Spring 2018. The Phase II system will include groundwater extraction, treatment, and discharge system to capture the RE108 Area Hotspot groundwater near the downgradient edge. Water will be treated to drinking water standards via air stripping and granular activated

carbon. The Navy is anticipating discharging into two recharge basins and are currently conducting infiltration testing. The system should be in place by 2022.

Mr. Sobolow asked if the funding was already allocated. Mr. Brayack answered yes.

Mr. Horan asked if the Williams Street well was going to be discharged into this basin. Mr. Brayack answered the Williams Street well is not going into the same basin and that the Navy is currently over pumping at the GM38 extraction system and will reduce the extraction rate to accommodate flow from RE108.

OU4 – SITE 1 FORMER DRUM MARSHALLING AREA CONTAMINATED SOIL, SOIL VAPOR, AND GROUNDWATER

Mr. Brayack, Tetra Tech, provided an update of the NWIRP Bethpage Site 1- Former Drum Marshalling Area history and the Proposed Remedy for soil, soil vapor and groundwater. The Proposed Remedy consists of soil excavation and offsite disposal and capping, groundwater monitoring, and enhanced soil vapor extraction to be implemented in 2019.

QUESTIONS AND COMMENTS

Following the technical presentations, the meeting was opened for follow-up questions and discussions. The discussion questions and answers are below:

1. **Will the Navy release its radium report to public, if so when?** Ms. Fly responded that the Navy is currently putting the report on the public website. The Navy report concluded the radium is naturally occurring and no distinct patterns were found. A Preliminary Assessment (PA) and Site Investigation (SI) is in process in addition to interviews of former Northrop Grumman (NG) employees. Sampling of onsite wells begins next week and the report when it is final can be emailed.

2. **If the radium is naturally occurring why are the concentrations higher as it moves down?** Ms. Fly responded that the Navy has conducted several rounds of sampling and no distinct patterns were identified. Radium was found at various concentrations. Mr. Brand with NYSDEC also responded that NYSDEC is reviewing the report and will make comments. NYSDEC has also been looking at the radium issue, and most of the data is from NYSDEC sources and looking at NG plants and building sites at the Former Grumman Plant.

3. **What is occurring currently at the Meade Ave and 1st and 2nd Street and what is the site number?** Mr. Brand answered that this is the first location of NYSDEC's preliminary drilling operations to put in additional removal wells under

the direction of the governor with HDR and USGS. HDR is doing the study which includes a modeling program, and hydraulic containment appears to be feasible and it will be out for public review this year.

4. **If the Navy and NG disposed of all the material properly then why do we have all the same contaminants in our groundwater that they "properly" disposed of?** Mr. Sobolow answered that disposal requirements have changed since the 1940s.

5. **Where can we access the requested investigation by Senator Schumer for the NYSDEC and Environmental Protection Agency (EPA)oversight to investigate with a team of hazardous waste investigators and radiation specialists, the interior of building # 26 that housed United States Department of Defense (USDoD) black room? This was to have been completed last summer.** Ms. Fly answered that the Navy has a public website that contains all of the investigations and results, but the Navy does not know about the Senator Schumer and NYSDEC investigation. Mr. Brand added building # 26 was the first building NYSDEC investigated at NG. Radiation experts went through the building room by room with meters and instruments including the exterior. Nothing was found.

6. **The radioactive drinking water wells were closed but this radioactive plume is left to mix and dilute in our aquifer, continually allowing us to drink low levels of bio-accumulating radioactive water over our lifetimes; what kind of remediation is this?** Mr. Boufis answered that the first detection of radium was in the Sofia Street well, which closed in 2012. In addition, there are over 1,000 drinking water wells on the island. Low levels of radium 226 and 228 are in most wells and is under 1.2 picocuries per liter, below the Maximum Contaminant Level (MCL) of 5 picocuries per liter. Residents never drank water from the Sofia Street well when the radium was above MCLs.

7. **Since Hooker Ruco has admitted to working with radionuclides at its sites, including their Hicksville site just north of NG Bethpage, which contributed to the Bethpage plume, has the Navy/NYSDEC investigated Hooker Ruco and spoke to Hooker Ruco former employees about the source of the radium in the test wells and the groundwater?** Mr. Brayack answered that the Navy is working with NG, and Hooker Ruco is an EPA site, not part of this investigation. The Hooker Ruco plume has been contained.

8. **The Hotspot remediation system GM-38, which was completed in December 2009 and is currently in operation, has tested positive for radium above the MCL, is this Hotspot being treated for radiological contamination? If not, why not?** Mr. Brayack answered that the data is in the radium addendum, the Navy has tested the treatment system discharge and it is less than the MCL.

9. **How fast is the plume migrating?** Mr. Caldwell answered that the groundwater itself moves about one foot a day, and the contamination doesn't move as fast. It moves at 0.75 feet per day.

10. **How will the excessive rain we had last week affect groundwater elevation?** Mr. Caldwell answered that the contamination is deeper than 600 feet and the rainfall events from last week would not reach that depth for many years.

11. **Why only testing for trichloroethene (TCE)? What about other contaminants like Perfluoroalkyl substances (PFAS), radon and its decay products already in the water, even if radon is eliminated due to daughter ½ lives are much larger than radon.** Ms. Fly answered that as part of the PA the Navy is not only testing for TCE but are also sampling for PFOA, polyfluoroalkyl substances (PFAS) and 1,4-dioxane, which will begin next week at all the onsite wells.

12. **If the drywells and cesspools as well as the drums in the Drum Marshalling Area were not also used to dispose of materials and washdown liquids from the "Black Rooms" and testing performed with the neutron generators, please explain how and where the radioactive wastes were handled, stored, disposed of, and sent to; if not to the Town of Oyster Bay, Syosset & Old Bethpage Landfills?** Ms. Fly answered that most of these questions will be answered during the investigation process of the PA and from on property sampling during the SI, to determine if these contaminants are there.

13. **If Site 1 does not contain radioactive soils, why does the additional cleanup work cost $30 million and take thirty years?** Ms. Fly replied that Site 1 deals with polychlorinated biphenyls (PCBs) that must be shipped to a specific landfill, most of the cost is for disposal and digging so deep. It is funded for thirty years.

14. **To the Navy and NYSDEC: With the amount of investigation and testing being performed at Bethpage, including radiation testing for contaminations caused by diluted liquids disposed in drywells, cesspools and sand sump retention basins, will testing be performed at the Town of**

Oyster Bay landfills where dense sludges and solids of hazardous toxic and radioactive waste were disposed? Mr. Brand answered that radium investigations are still ongoing and NYSDEC is completing a review of historical data by NG, which will be part of the final determination and report. NYSDEC does have an initiative ongoing statewide as part of the governor's program and are investigating old closed landfills and have imitated a sampling program at about ten landfills in Long Island. NYSDEC will have the results and periodic reports and post on the web page. The radium report is still under evaluation and that will also be provided on the NYSDEC website.
https://www.dec.ny.gov/chemical/8431.html

15. **Relative passed away who worked for NG from the 1950s to 2000 from Myeloma, a cancer commonly caused by low dose long-term radiation exposure. How many former NG/Navy/Personnel employees have died of "Atomic Veteran" type cancers?** Mr. Karpinksi (NYSDOH) answered that the health department does not track cancer incidences by employment history. Since the 1990s medical staff started recording employment information but they do not always report it. NYSDOH does track cancer incidences but being able to identify if the person was former NG employee is extremely difficult to track.

16. **When does the Navy anticipate that funding will be made available for planning and cleanup (Phases III and IV) of formerly US Navy owned Formerly Utilized Defense Sites (FUDS) and Formerly Utilized Sites Remedial Action Program) FUSRAP sites in Nassau County for the US Army Corps of Engineers?** Ms. Fly answered that Phases I and II are funded and the Navy does not have a Phase III and IV.

17. **Where did the huge amounts of PCBs in site 1 come from?** Mr. Brayack answered the PCBs were used for heating and were used to store transformers and at Site 1. In addition, autoclaves, which are like big ovens that use transformer fluid, were used onsite for aircraft parts.

18. **When will a site be selected for the treatment plant?** Mr. Brayack answered that they are in the process right now and the process is ongoing depending on who owns the parcel and the cost.

19. **What locations are currently being considered for the treatment plant?** Mr. Brayack replied that they cannot discuss this publicly.

20. **Does the Basis of Design Report (BODR) include remediation for 1,4-dioxane?** Mr. Brayack answered that a report has just been issued which contains contingencies to address Chlorinated Volatile Organic Compounds (CVOCs) 1,4-dioxane and how to treat 1,4-dioxane and to comply with standards.

21. **Who is drilling well by 3rd Street and Bethpage and what is the purpose?** Mr. Sobolow answered that it could be NG but no one knew who was drilling that well.

22. **If the MCL for Volatile Organic Compounds (VOCs) is 5 parts per billion (ppb) why is the highest Hotspot contour defined at 1,000 ppb? What is the highest level of VOCs found in your 18 miles of drilling? Didn't NG find VOCS above 1,000 ppb?** Mr. Caldwell answered that the 1,000 ppb is an element of the ROD and highest that has been found so far is 4,600 ppb and that was the very first detection. Mr. Pelton added that the RW21 area hotspot NG has found TCE exceeding 1,000 ppb. He added that NG is working on access issues like the Navy for discharge for the three extraction wells already installed. He added that NG is currently looking at 15 locations for the extraction well discharge.

23. **When is the RAB meeting going to change its meeting process, we keep hearing about how the Navy is working hard to fix the plume, however, the Navy is doing what they are mandated to do and has let the plume reach 4 miles.** Mr. Brayack answered that this is an informative meeting to address questions that RAB members have so residents can ask questions. The Navy is not going to change the format and we think they are going smooth. Mr. Horan commented that there have been positive results and that's why contentiousness is gone. Mr. Horan also indicated that NG representatives have not attended the RAB meetings, but the state and local agencies are working together, and things are getting done.

24. **Newsday stated the Navy has sent their report on radiological groundwater to Congress and feel that radium levels in Bethpage are naturally occurring. Is it true that the Navy records only go back to 1962? If so, how can a conclusion be made? An example 300 planes a month were built, how can we say radium dials were not dumped.** Ms. Fly replied that the report NG supplied to NYSDEC stated that the records were dated back to the 1960s and that is what the Navy is using to make the determination. A resident commented that from 1942 to 1943 the Navy forced NG to change operations to

get F16 running and the Navy should have records for these orders. Ms. Fly replied that the Navy was dealing with a war and needed planes and NG made them, so we could fight the wars.

25. **On page 24 RE121 and TT101 show the contamination at 800ppb South of Hempstead Turnpike. How can you project the RE108 Hot Spot south of Hempstead Turnpike on page 42 in 2023? By your own presentation, it is already there.** Mr. Brayack answered that we are collecting data on how RE108 is moving and project the Hotspot to move south of Hempstead within a year. He added that the Navy did anticipate putting a treatment system near there but have shifted the location south.

26. **Is this contamination still being input into the plume?** Mr. Brayack answered that the Navy and NG believe they have eliminated the sources. The Navy ran an Air Sparge/Soil Vapor Extraction (AS/SVE) system at Site 1 for CVOCs. NG is running the OnSite Containment System (ONCT) designed to prevent further release of contamination of both properties.

27. **After many years of being familiar with this site why is the project manager being changed? Won't this set back the remedial program?** Mr. Murray answered that organizationally, the Navy has made some changes and that the he has over twenty years' experience of similar work, working with the same contaminants. Mr. Murray also added the Navy is supported by really great contractors that will continue to work on resolving the plume. Mr. Murray added that the Navy will continue to fund and remediate the plume.

28. **Has a real estate study been completed regarding property values within plume**? Ms. Fly answered that the Navy cannot address this issue.

29. **When will sampling for radium be completed?** Ms. Fly answered that the radium testing would be completed next week.

30. **Do you have a plume cross section diagram available for the RE108 hotspot?** Mr. Caldwell answered that yes, they did have a series of eight cross sections and were in the final process of the report. Mr. Caldwell added that the cross sections run North to South and East to West and would be released in a report in the next month.

31. **Multiple properties within the Hot Spot have had soil and soil vapor tested, resulting in high contamination levels. How will contaminated soil and soil**

vapors be remediated? Mr. Brayack answered that there has been some contaminated soil and soil vapor at Site 1, but not near the hotspot.

32. **Can we get more information on Williams Street well?** Mr. Pelton stated that the Williams Street well is associated with NG in the OU3 plume. In addition, Mr. Pelton had already answered that extraction wells need a discharge location and the original operation schedule was anticipated to be later that year but now possibly 2019. Mr. Pelton added that there are probably a lot of source areas over the 600-acre facility, including recharge basins and from the OU3 contamination remaining in deep soils, and NYSDEC is working with NG to address the issue. The remedy involves heating the soil and catching the vapor with vapor extraction wells. NG has four pumping wells downgradient to prevent it from moving.

33. **Is NG checking for radium?** Mr. Pelton answered that yes, they are sampling monitoring wells and extraction wells and have provided the data, and that they are not treating because there are no exceedances.

34. **What is the qualitative analysis of pollutants in water where radioactivity that is over 5 picocuries is found? Is NYSDOH doing any supplemental checking?** Mr. Boufis answered that the water districts test for radium 226 and 228 and alpha, and the results are being misinterpreted because of the school results. The operating water district wells are well below the MCL.

35. **When you say it is a funded project does that mean all the money is available now, or is it spread over a number of years? Could the project be held up because the money is in out years?** Ms. Fly answered the Navy has funded all work at Site 1 and has planned funding for RE108. Phase I is funded and Phase II is budgeted.

APPENDICES

APPENDIX A

18 APRIL 2018 RAB MEETING SIGN-IN SHEET

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Steven Scharf			
WALTER PANUSH			
Charles Pleckaitis			
JOHN SULLIVAN			
Laura Schaefer			
Richard Buck			
Rich Humann			
Teri Black			
Elayne Candiotte			
John Budnick			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Laurel Rasmussen			
SANDRA D'ARCANGELO			
SAUL ASH			
JOHN COUMATOS			
Alyse Dellefave			
William Glueckert			
Emily Dooley			
Cindy Rogers			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Christine Insign			
Bill Pavone			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
FORTUNATO MARINO			
Tom McCARTHY			
JEAN ANDREUCCI			
John Lovejoy			
Eleanor Vivaldo			
Mike Zobel			
James Christie			
Patricia Kivo			
Sam a Das			
Jim Burdge			
Joseph Terranova			
Michael Lehtinen			
Greg Foreman			
ANTHONY TAORMINA			
Theresa Walsh			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Don Hesler			
Jason Pelton			
DAVID SOBOLOW			
Pamela Cosenza			
Richard Cosenza			
FRANK KOCH			
RICH LENZ			
BOB HORAN			
John Swartwout			
Sal J. Greco			
Donna Rasmussen			
John Reinhardt			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
CARMEN TIERNO			
Steve Karginski			
Rose Marie Walker			
Patty Donohue-Brown			
James Donnelly			
Melissa Forrest			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Lori Leistman			
Theresa Colubella			
Joseph Velardi			
Mike Boufis			
Emily Brown			
Manfred Bohm			
JC Kreidel			
Jeffrey Doepp			
JOE McCann			
Raymond Avery			
Frank Russo			
Vincent Varriale			
Anne Carey			
Mike Ingham			
Adrienne Esposito			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Michael Reid			
EDWARD OLMSTED			
Stan Carey			
Alyssa Meano			
Michael Hampton			
Min-Sook Kim			
Dakota Tarbell			

42nd RAB Meeting for NWIRP Bethpage
April 18, 2018
Sign-in List

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Melissa Cushing			

APPENDIX B
RAB MEETING AGENDA AND DEFINITIONS

TETRA TECH

Agenda for Restoration Advisory Board

Naval Weapons Industrial Reserve Plant Bethpage

Date: April 18, 2018

Time: 6:30 PM

Location: Bethpage Community Center-103 Grumman Road West, Bethpage NY

Time: 6:30 PM to 7:00 PM

- Open house - general questions from the public

Time 7:00 PM to 8:00 PM

- Ground Rules – The Management Edge
- Introduction of RAB members and Regulators – Navy Co-Chair/Community Co-Chair
- Distribution of Minutes and Status Update – Navy
- OU-2 Offsite Groundwater Investigation – Resolution
- GM38 Area Hotspot Treatment System – Recharge Basin Rehabilitation and Injection Well Testing – Tetra Tech
- RE108 Hotspot Treatment – Tetra Tech
- OU-4 Site 1 Former Drum Marshalling Area Contaminated Soil, Soil Vapor, and Groundwater – Tetra Tech

Time 8:00 PM to 8:30 PM

- Questions – Community Co-Chair
- Closing remarks – Navy

Copies of information can be found at the document repository located at the Bethpage Public Library, 47 Powell Avenue, Bethpage NY 11714 (516 931 9307) or online at http://go.usa.gov/DyXF

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Tel 757.461.3768 Fax 757.461.4148 www.tetratech.com

Definitions and Clarification of Terms, Acronyms and Abbreviations

For the Bethpage Restoration Advisory Board (RAB)

- **Basic:**
  - VOC--Volatile Organic Compounds:
    - Chlorinated solvents (typically used as degreasers in manufacturing)
  - Effluent
    - Is an outflow of water from a treatment source
  - Free Product
    - Substance (usually oil or gasoline) that exists in its own state-it is not dissolved in water.
  - Soil Vapors
    - Gases contained in the pore spaces of soil
  - Capture Zone
    - Area of water whose flow direction is influenced by pumping
  - Ground Water
    - Water flows through open pore spaces of soil
  - Down gradient
    - The direction of groundwater flow
  - Plume
    - An area that impacts from chemicals are detected in
  - Raritan Clay Layer
    - A geologic horizon - Clay that is approximately 800-100 feet below ground surface – accepted to be the bottom of the Magothy aquifer
  - Aquifer
    - an underground layer of water-bearing permeable rock or unconsolidated materials
  - Trichloroethylene-
    - Volatile organic compound of concern (used as a degreaser in manufacturing)
  - OU- Operable Unit
  - BGS - Below Ground Surface
  - PCB- Polychlorinated Biphenols (used as transformer cooling fluid)
  - NG- Northrop Grumman
  - NWIRP-Naval Weapons Industrial Reserve Plant
  - No. 6 Fuel Oil- tar
  - Hot spot
    - Area where trichloroethylene is at a concentration greater than 1000 parts per billion
  - BWD Plants- Bethpage Water District Plants

- **Data Gathering:**
  - Gauging- measurement of ground water levels from top of ground surface
  - In-situ – in place
  - Delineate- define boundaries
  - VPB- Vertical Profile Boring
  - Monitoring Well- (typically 2-6 inches in diameter) a well used to provide a "snapshot" of water quality when sampled

- **Treatment Technologies:**
  - Biosparging
    - Removal of chemicals by breaking them down with bacteria
  - Steam Injection/Free Product Recovery
    - Heating of oil that has a tar like consistency with steam to make it flowable (syrup like consistency) so that it may be removed
  - Air Stripping
    - Removal of dissolved volatile organic compounds from water by transferring it into air
  - Land Use Controls
    - Action that restricts what land can be used for
  - Vapor Phase treatment-
    - Removal of a chemical from gas; used to remove trichloroethylene from air vapor
  - Biodegradation
    - Reduce a chemical by changing conditions so that bacteria can break down the chemical
  - On-site Containment Treatment System (ONCT)
    - Series of wells that remove and treat groundwater at the southern edge of the former Northrop Grumman property
  - SVECS—Soil Vapor Extraction Containment System
    - Vacuum for volatile chemicals trapped in the air between soil particles; used to remove trichloroethylene
  - Equalization Tank
    - Tank for mixing
  - Liquid Phase Granular Activated Carbon Polishing
    - Removal of remnants of a volatile chemical by passing liquid through carbon; used to remove trichloroethylene

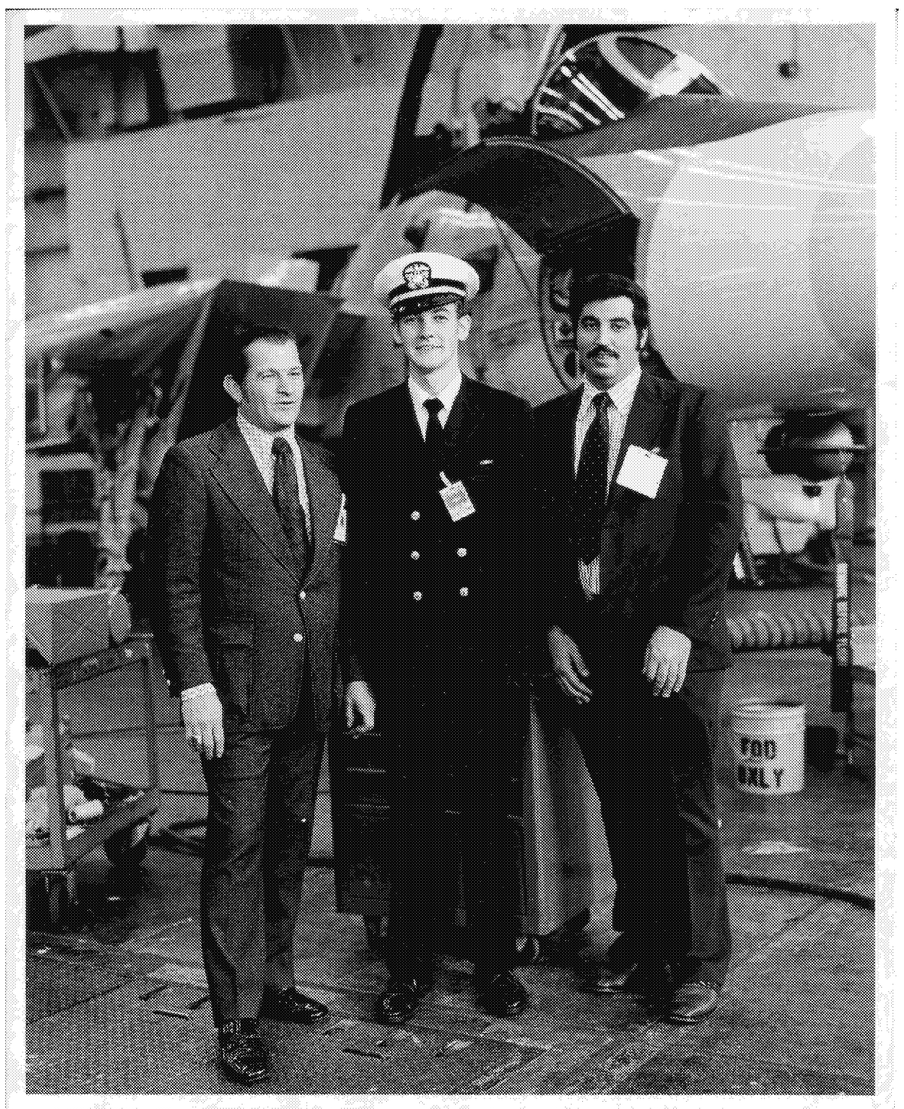
- Recharge basin
  - Sandy basin that receives storm water and allows water to filter down into the ground
- Recovery Well
  - (Typically larger diameter 12 to 36 inches) a well used to recover oil or water containing chemicals

- **Regulatory:**
  - Proposed Plan- Plan of action that is sent to the state for approval prior to the Final Record of Decision
  - Feasibility Study- collection of data used to determine if a remedy will work
  - ROD –Record of Decision
  - Compliance sampling- collection of samples to demonstrate that chemicals are below regulatory levels
  - CERCLA- **Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)** – the legal mechanism for cleaning up inactive hazardous waste sites at DOD (Depart of Defense) facilities, this is the defining regulation for the Navy's Environmental Restoration (ER) Program at NWIRP Bethpage under NYSDEC authority.
  - RCRA- **Resource Conservation and Recovery Act (RCRA) Corrective Action** – a statutorily required cleanup program, similar to CERCLA, that addresses active solid waste management units and contaminated media as a condition of RCRA permits - NWIRP Bethpage has a RCRA Permit with NYSDEC
  - NYSDEC- **New York State Department of Environmental Conservation (NYSDEC)** provides regulatory review and approval of Navy actions at NWIRP Bethpage
  - NYSDOH- **New York State Department of Health (NYSDOH)** assists NYSDEC.
  - USEPA- **United States Environmental Protection Agency (USEPA)** Provides federal review of the Navy actions.

APPENDIX C
POSTERS

NWIRP BETHPAGE HISTORY

The primary mission of the **Naval Weapons Industrial Reserve Plant (NWIRP) Bethpage** was to research, design, build and test military aircraft in support of our national defense



1941

Northrop Grumman (NG) purchased the property and started production of aircraft during WWII. Later, the Navy and NG exchanged properties, resulting in a 109-acre Government-Owned Contractor-Operated (GOCO) facility and a neighboring 550-acre NG-owned and operated facility

1986

Navy Environmental Restoration Program began - initial studies identified sites on NWIRP Bethpage requiring further investigation

1998

NG returned operational control of the NWIRP Bethpage to the Navy

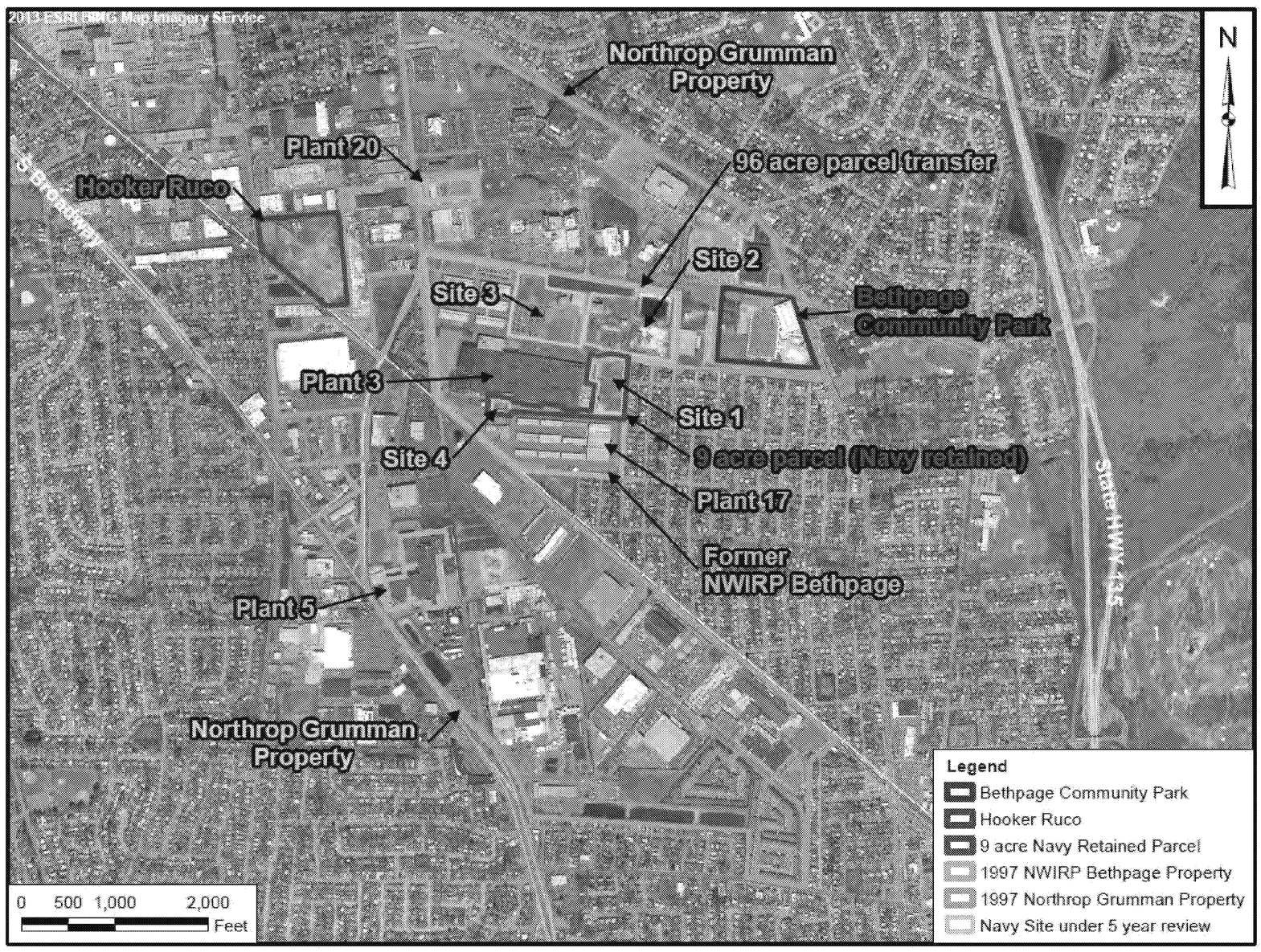
2008

Navy transferred 96 acres of NWIRP Bethpage property to Nassau County for economic redevelopment. Remaining 9 acres were retained by the Navy to complete Environmental Restoration Program requirements.

Present

Environmental Restoration Program work continues at two sites on former NWIRP Bethpage and for off-site groundwater contamination.

ENVIRONMENTAL RESTORATION SITES



Environmental Restoration Complete:

- **Site 2:** Recharge Basins (2002)
- **Site 3:** Salvage Storage Area (2002)

Environmental Restoration Occurring:

- **Site 1:** Former Drum Marshalling Area
- **Site 4:** Former Underground Storage Tanks (USTs)

CLEANUP TEAM

- The Navy's Environmental Restoration Program is conducted to meet requirements of the ***Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)***
- The Navy is the lead agency for environmental restoration at NWIRP Bethpage under CERCLA
- ***Naval Facilities Engineering Command (NAVFAC)*** manages the program at NWIRP Bethpage

- The ***New York State Department of Environmental Conservation (NYSDEC),*** with assistance from the ***New York State Department of Health (NYSDOH),*** is the lead state agency providing regulatory support for NWIRP Bethpage.
- The ***United States Geological Survey (USGS)*** provides technical support on groundwater issues.

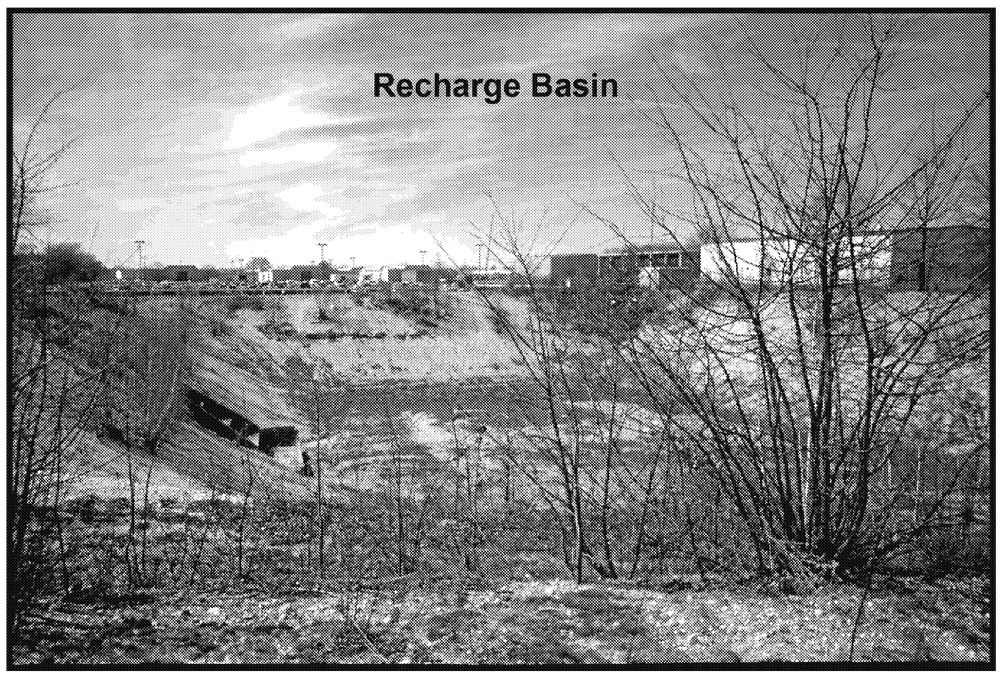
SITE 2 – RECHARGE BASINS

Man-made impoundments

- Collected storm water run-off, cooling water from air conditioning units, and rinse waters from Northrop Grumman (NG) operations

Sludge Drying Beds

- Used to dewater sludge from Industrial Waste Treatment Facility from NWIRP and NG operations



Polychlorinated biphenyls (PCBs) in Soil

- 7,000 tons of soil removed (1996)
- Soil and gravel cover added (2001)
- Land use controls in place requiring maintenance of the soil and gravel cap and limiting future land use (2002)
- **Site was transferred to Nassau County (2008)**
- **Recharge Basins continue to receive storm water runoff from former NWIRP Bethpage property and former NG property, and treated groundwater from the Bethpage Community Park**

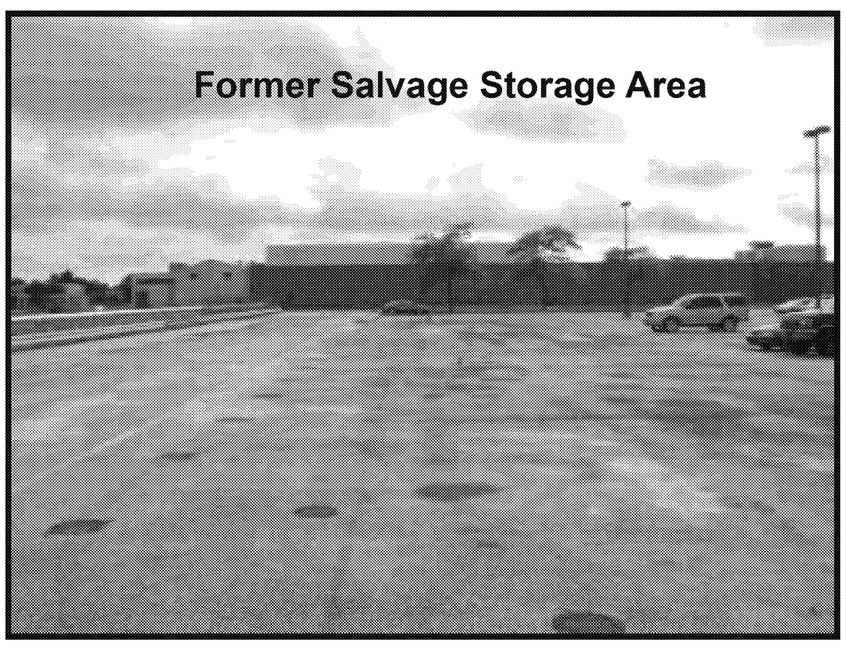
SITE 3 – SALVAGE STORAGE AREA

History

- Used by NG from 1950 to 1969
- Consisted of a parking area, salvage storage area, and three warehouses
- Fixtures, tools, and metallic wastes were stored on site
- While in storage, cutting oils dripped from some materials
- Now partially covered with asphalt

Volatile Organic Compounds (VOCs) in Soil

- Low-levels of VOCs in soil
- Clean soil and asphalt were placed over areas of the site to prevent exposure
- Fencing and security measures prevent public access
- Restrictions limiting future use of the site.
- **Land was transferred to Nassau County in 2008.**



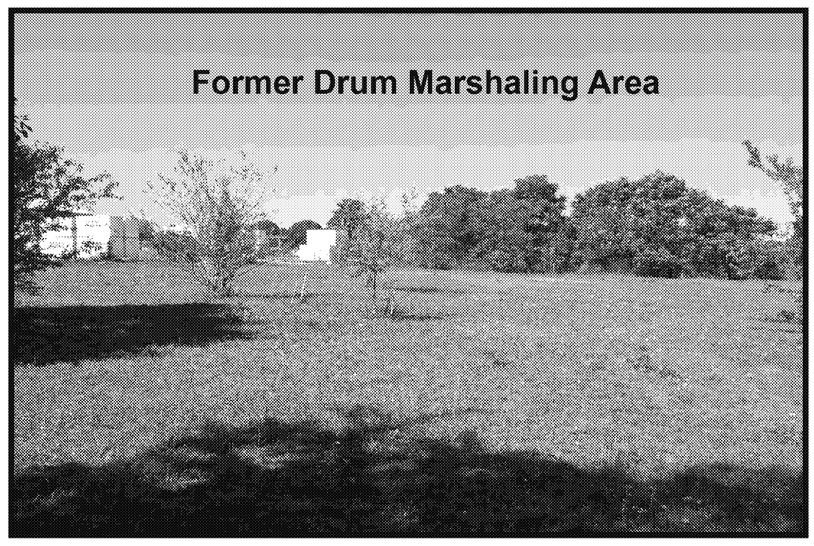
SITE 1 – FORMER DRUM MARSHALLING AREA

Leaching Wells

- Approximately 120 leaching wells underlying most of Site 1
- Received sewage discharge from Plant 3 until 1968

Drum Storage

- Two areas were used to store drums of waste primarily from Plant 3
  - Chlorinated and non-chlorinated solvents
  - Liquid cadmium and chromium wastes
  - Polychlorinated biphenyls (PCBs)
- Currently grass-covered field



Volatile Organic Compounds (VOCs) in Soil and Shallow Groundwater

- Extraction system removed roughly 4,520 pounds of VOCs between 1998 and 2002
- VOC concentration in groundwater beneath Site 1 reduced by 95%
- **Met Cleanup Goals for protection of groundwater, no further action needed to protect groundwater from soil**

PCBs, Polynuclear Aromatic Hydrocarbons (PAHs), and Metals in Soil

- Over 100,000 cubic yards of soil has been impacted
  - PCB contamination from the surface to 65 feet deep
  - PAHs and metals also in soil
- **Navy is finalizing the Record of Decision (ROD)**
- **Cleanup to start in 2019**

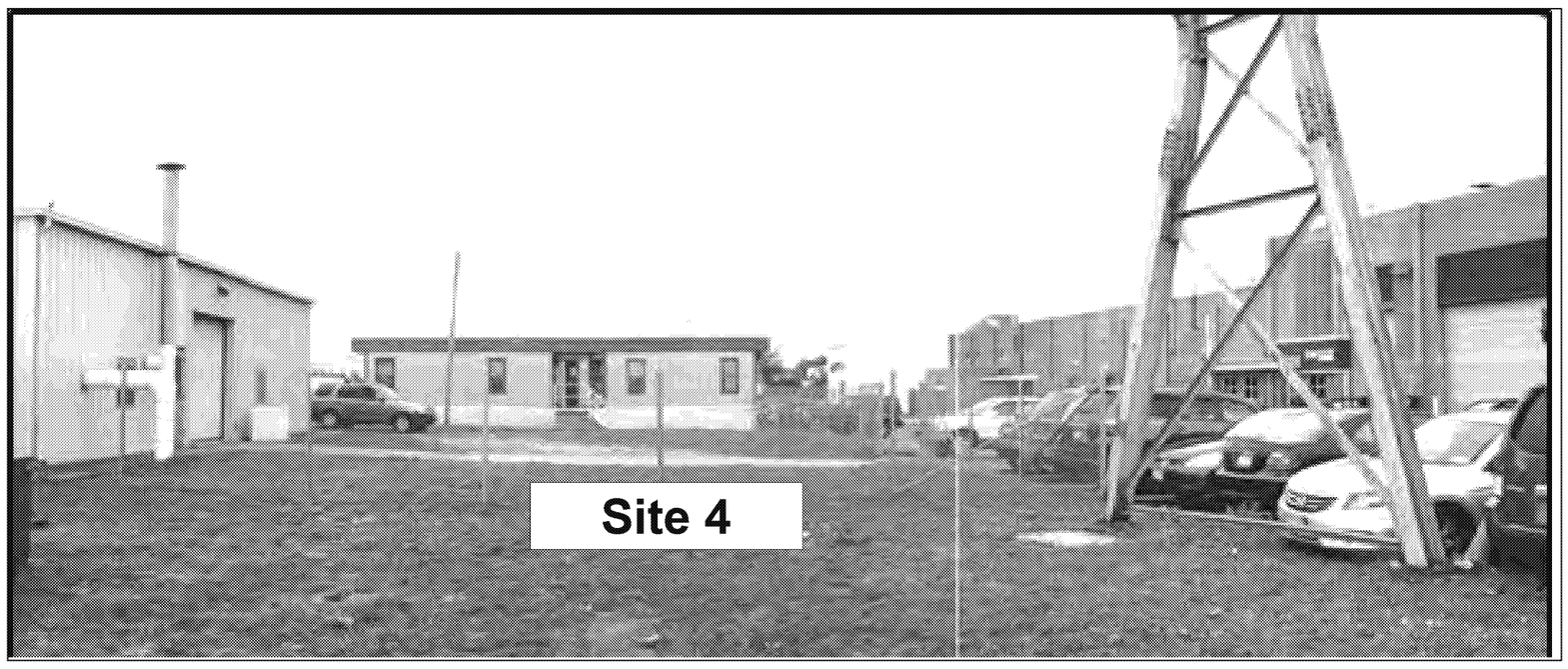
VOCs in Soil Vapor

- In 2008, VOC-contaminated vapors were found in off-site soil gas
- Off-site impacts initially addressed by in-home removal actions in early 2009
- Late 2009 - a fence line soil vapor extraction containment system was installed on Navy property to:
  - Draw back vapors that had moved off-site
  - Prevents additional soil vapors from moving off-site
- **System continues to operate**

SITE 4 – FORMER UNDERGROUND STORAGE TANKS

Number 4 and 6 Fuel Oil Tanks

- Northrop Grumman (NG) removed the tanks in 1980s
- Contained tar like petroleum product



Petroleum Products in Soil and Groundwater

- Investigations by the Navy indicated petroleum in soils 30 to 71 feet deep, near and below the water table
- Impacted soil covers an area of approximately 0.14 acre
- Minimal groundwater impacts
- Consistent with Site 4 ROD, petroleum is commingled with VOCs

Selected Remedy

- Recover fuel oil free product from groundwater
- Biodegradation Polishing
- Groundwater Monitoring

Timeline

- **Nov 2015** - Record of Decision (ROD) signed
- **2017** – Started Cleanup
  - Anticipated to **operate for 2 to 4 years**
  - **Groundwater Monitoring** to continue for **more than 10 years**

Groundwater

Historic storage and disposal practices resulting from Northrop Grumman (NG) operations at the former NWIRP Bethpage site, adjacent former NG-owned properties and other possible source areas have resulted in Volatile Organic Compound (VOC) contamination in the local groundwater.

Operable Unit 2 (OU2) Groundwater Plume: Over several decades, contaminated groundwater that originated at NWIRP Bethpage and NG facilities has moved off-property, generally to the south and southeast.

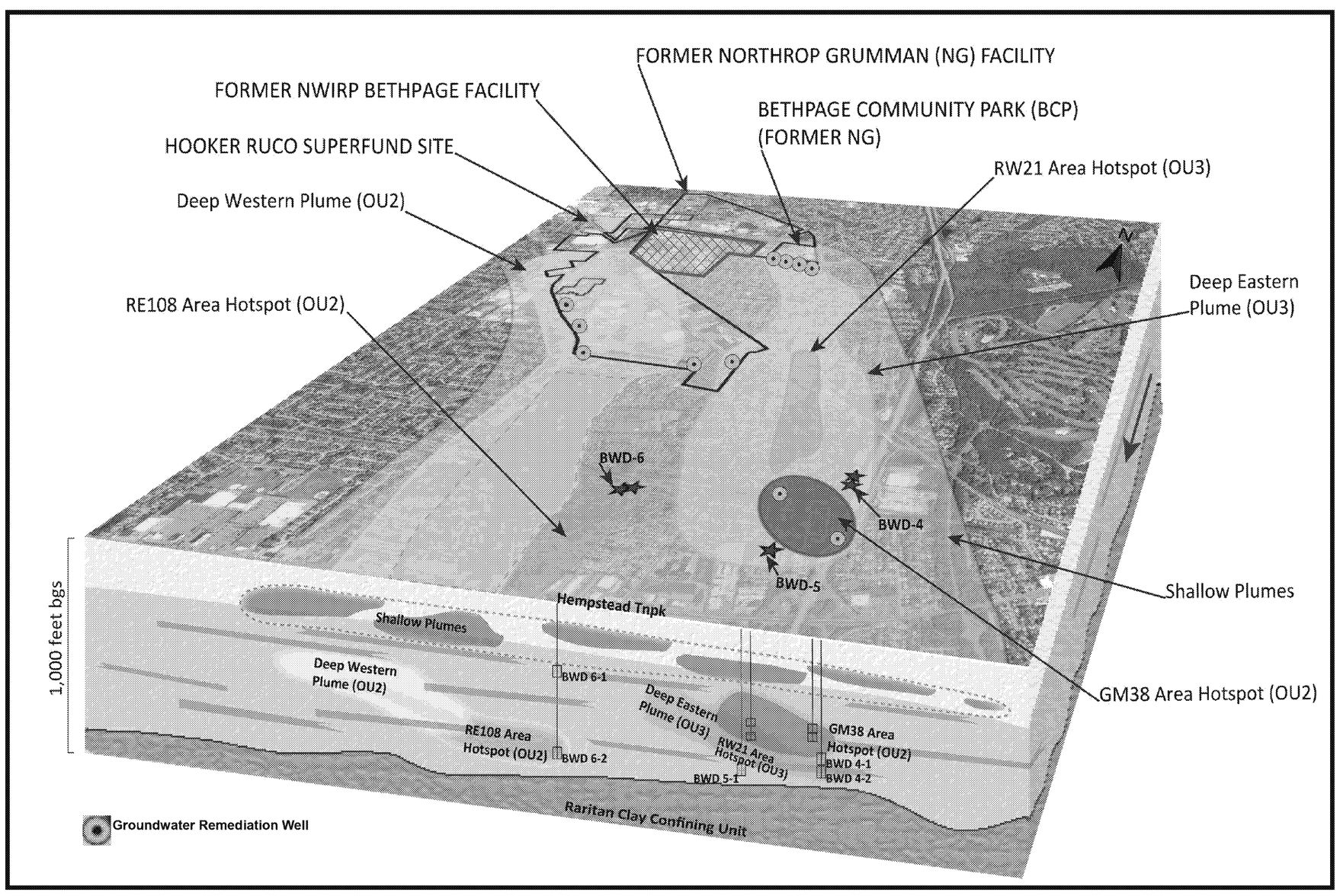
Complex Groundwater Plumes

- VOC contamination covers over 3,000 acres
- VOCs are not distributed evenly
- Variety of concentrations at various depths in different areas
- Most of the groundwater is free of VOCs
- Multiple, widely dispersed plumes, or “fingers,” throughout the area
- Drinking water wells alter natural groundwater flow

Shallow Plume: VOCs are located in groundwater approximately 50 to 300 feet deep in a large general area south of the former NWIRP Bethpage and former NG property. This plume is also impacted from multiple small businesses and former septic systems.

Deep Western Plume: VOCs are located in groundwater (deeper than 300 feet) south of the former NWIRP Bethpage site, former NG property, and Hooker Ruco Superfund Site, and continuing south of Hempstead Turnpike.

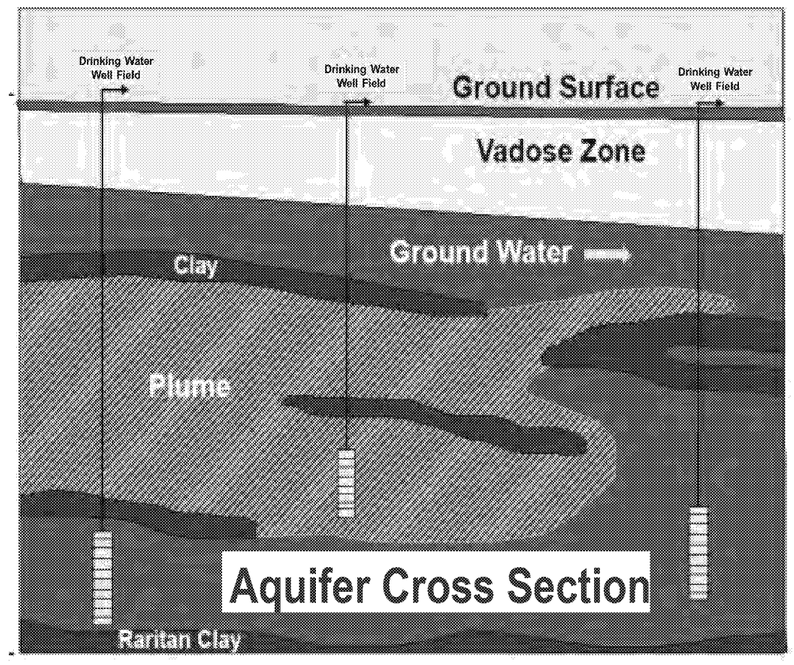
CONCEPTUAL PLUME MODEL – NORTH OF HEMPSTEAD TURNPIKE



Deep Eastern Plume: VOCs are located in the groundwater (deeper than 300 feet) on former NG property east of the former NWIRP Bethpage site, starting in the area of the Bethpage Community Park (BCP) and continuing south of Hempstead Turnpike (also known as the BCP Plume).

GM38 Hotspot: VOCs were located in groundwater approximately 300 to 500 feet deep in an area southeast of the former NWIRP Bethpage site and north of Hempstead Turnpike. Hotspot treatment is nearing completion.

RE108 Hotspot: VOCs are located in groundwater approximately 500 to 750 feet deep within the Deep Western Plume.



Mapping, management and cleanup of the groundwater are very challenging because of the complex geology, drinking water well field influences, size, depth, and variable distribution of the VOCs.

Navy 2003 RECORD OF DECISION (ROD)

The Navy, with regulator concurrence, issued its federal cleanup and management plan to address OU2 groundwater contamination resulting, at least in part, from the NWIRP operations.

Approved Groundwater Remedy:

- Legal Restrictions on Groundwater Use
- Groundwater Monitoring and Hotspot Treatment
- Public Water Supply Protection Program

Full Containment of the OU2 Groundwater Plume is not feasible as concluded by a panel of national experts in 2011.

Groundwater Monitoring

PURPOSE

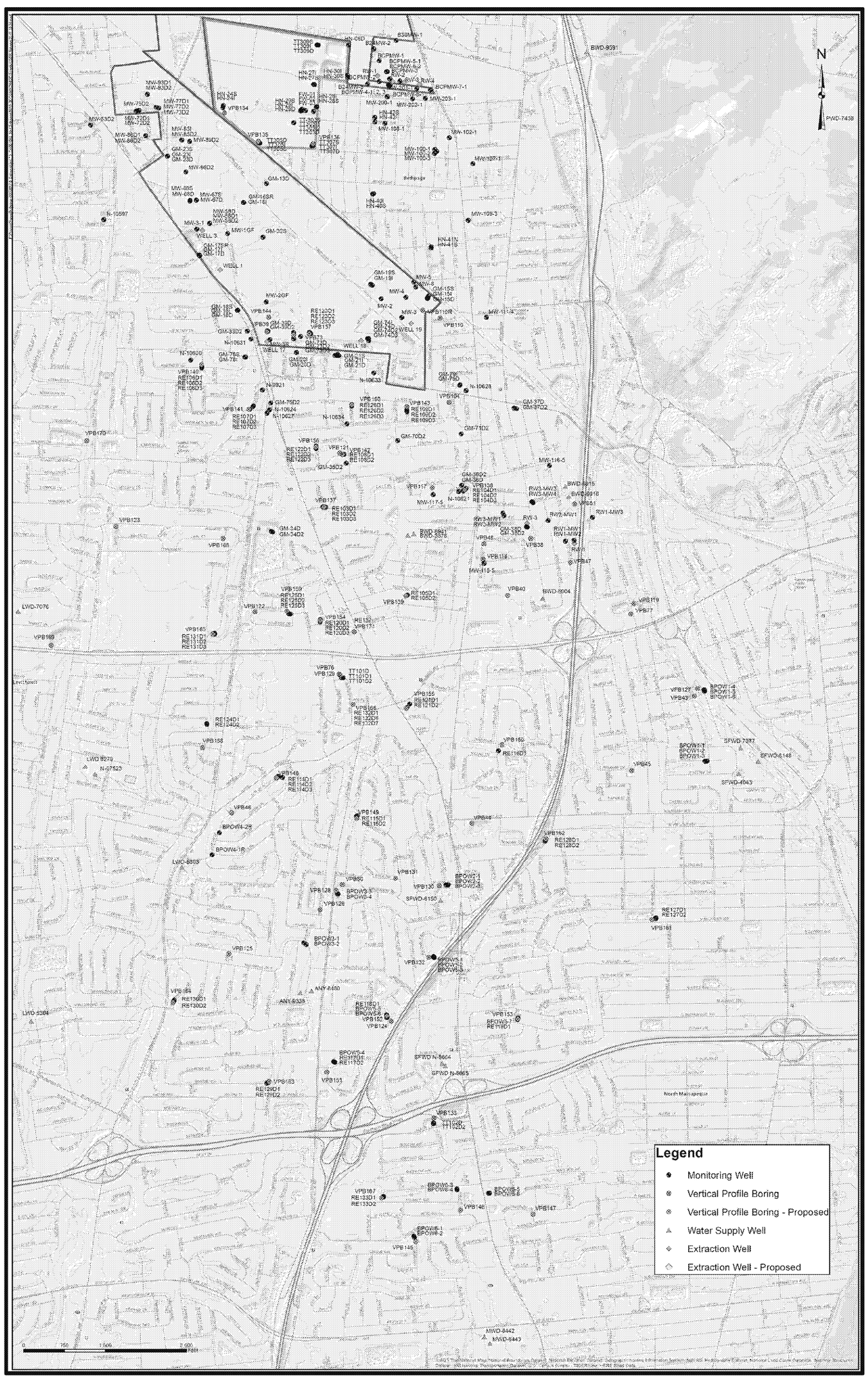
- Determine and monitor groundwater contamination south of NWIRP Bethpage and Northrop Grumman (NG) property
- Implement “hot spot” remedy(ies) as needed
- Provide wellhead treatment for potentially impacted public water supplies
- Coordinate with NG to help it address its OU2 responsibilities under the 2001 NYSDEC ROD

MONITORING COMPONENTS

- Requires property access agreements
- Vertical Profile Borings (VPB) - quickly screen areas for the presence, depth, and concentration of contamination
- Permanent Monitoring Wells (MW) - confirm presence/absence of contamination and develop trends
- Water levels measurements - support United States Geological Survey modeling and capture zone analysis

Vertical Profile Borings

- Locations selected by the Navy and NYSDEC
- Generally located on township or county right-of-ways
- Advance notification provided to nearby residents
- **12-inch** diameter hole drilled into the ground
- Final boring is **860 to over 1,000 feet deep** (extending to the Raritan Clay Layer)
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater
- **44 groundwater samples** are collected per boring and analyzed for VOCs
- **4 to 8 weeks** to complete a boring/well



2000-2017: Navy installed over 55 borings and over 100 monitoring wells. Data is shared with NYSDEC, public, and other stakeholders. Additionally, NG has installed its own borings and monitoring wells that also provide data to the OU2 Program.

HOT SPOT TREATMENT

Hot Spots are areas with greater than 1,000 parts per billion (ppb) trichloroethene (TCE), which is the primary Volatile Organic Compound (VOC) contaminant in the OU2 Groundwater

GM38 Hot Spot

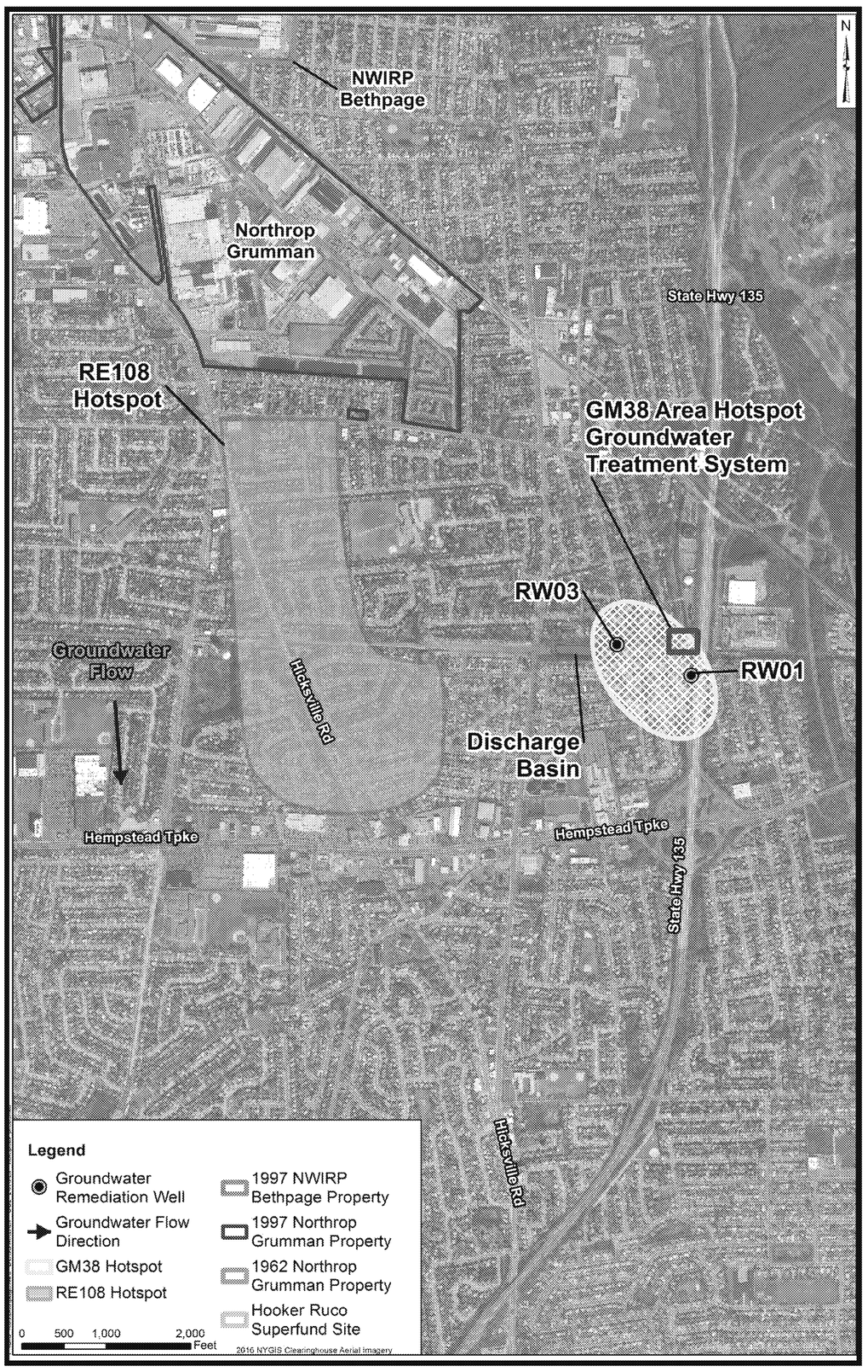
- Approximately 1.6 miles southeast of former NWIRP Bethpage and former Northrop Grumman (NG) property
- Groundwater flows from the former NG and NWIRP facilities to the hotspot area
- Originally 38 acres in size
- Variable depths between 300 to 500 feet deep
- Now less than 200 ppb; groundwater concentrations have decreased by over 80 percent

GM38 Groundwater Treatment System

- Installed, operated, and maintained by the Navy in accordance with the Navy's OU2 ROD
- Operated by the Navy since 2009 to remove VOCs in groundwater to achieve drinking water standards
- Recovery well pulls groundwater to the surface
- VOCs are then removed from the groundwater by air stripping and carbon filters
- Samples are collected from eight monitoring wells to determine the system's effectiveness
- Approximately 4.0 billion gallons of groundwater containing over 5 tons of VOCs have been captured and treated

RE108 Hot Spot

- Identified by the Navy 2011; located north of Hempstead Turnpike
- Approximately one mile south of former NWIRP Bethpage and NG property
- Approximately 500 -750 feet deep
- Additional drilling/sampling planned to the west of RE108
- Treatment options are being evaluated
- A treatment system is currently being designed



PUBLIC WATER SUPPLY PROTECTION

Navy works with NYSDEC, water districts, and NG to use groundwater monitoring results to predict potential impacts to public water supply wells and install wellhead treatment systems to remove VOCs down to concentrations meeting drinking water standards

Wellhead Treatment Systems Funded by U.S. Navy

Bethpage Water District (BWD)

- Plant 5 - 1996
- Plant 6 - upgrades, 2011

South Farmingdale Water District (SFWD)

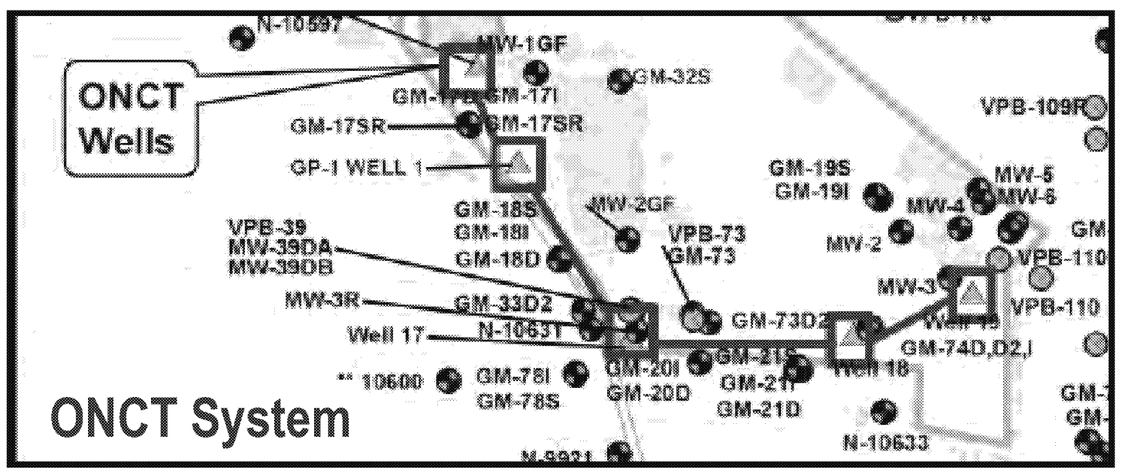
- Plant 1 - 2011
- Plant 3 - 2013

New York American Water (NYAW) Seamans Neck Rd,

- Interim system, 2012
- Full scale system, 2015

NORTHROP GRUMMAN ON-SITE CONTAINMENT

- Captures groundwater at the south and southwest edges of the former NG property to prevent further off-site movement
- **System is operated and monitored by NG with quarterly and annual reports provided – Navy has no control over or involvement in environmental cleanup decisions for NG**
- VOC data indicate some contamination may be bypassing the system
- NG evaluated the effectiveness of the ONCT system in 2016 and determined that the system was operating properly.
- Navy is continuing to reviewing data to verify that residual NWIRP contamination is not migrating beyond NG's containment system.



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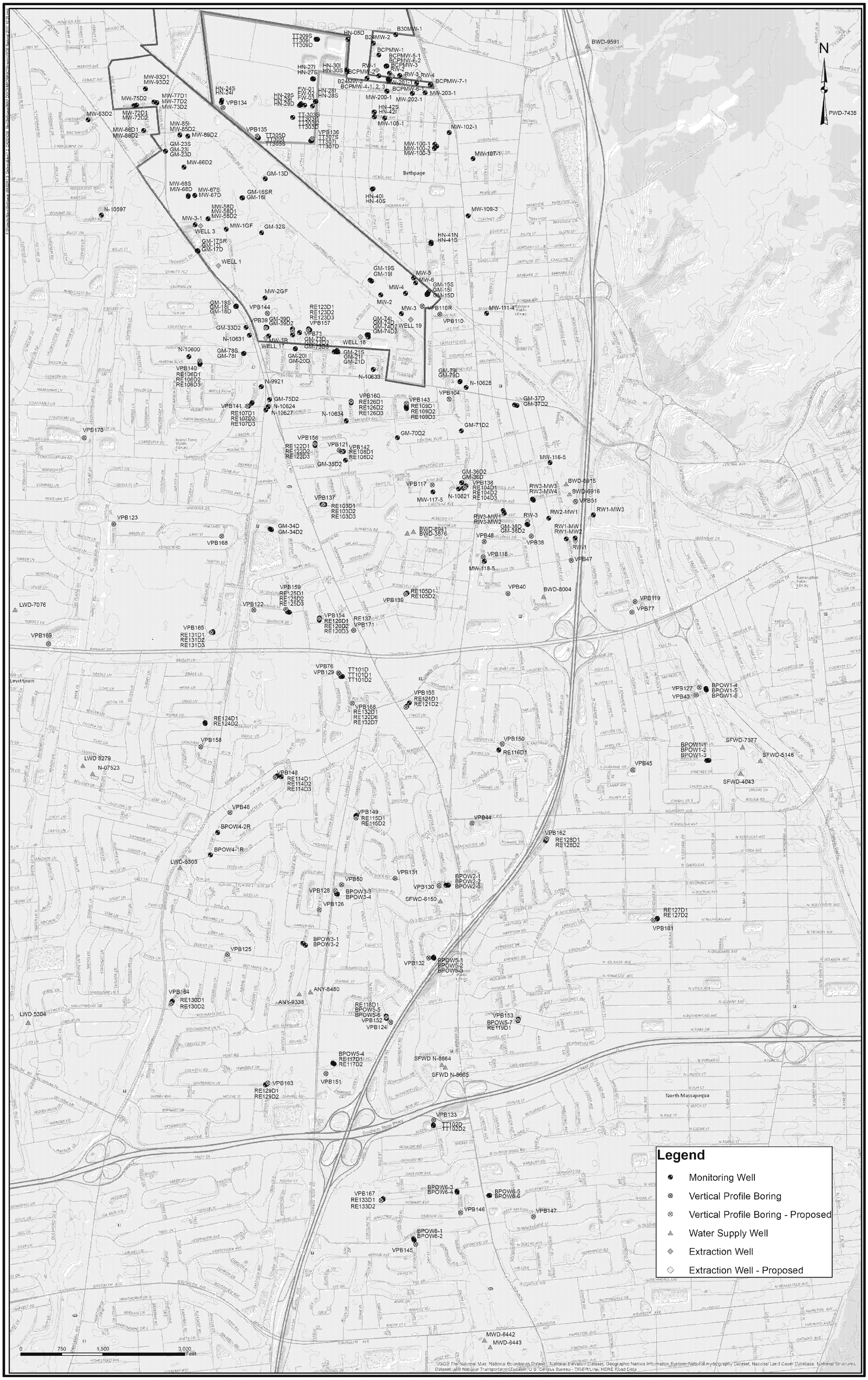
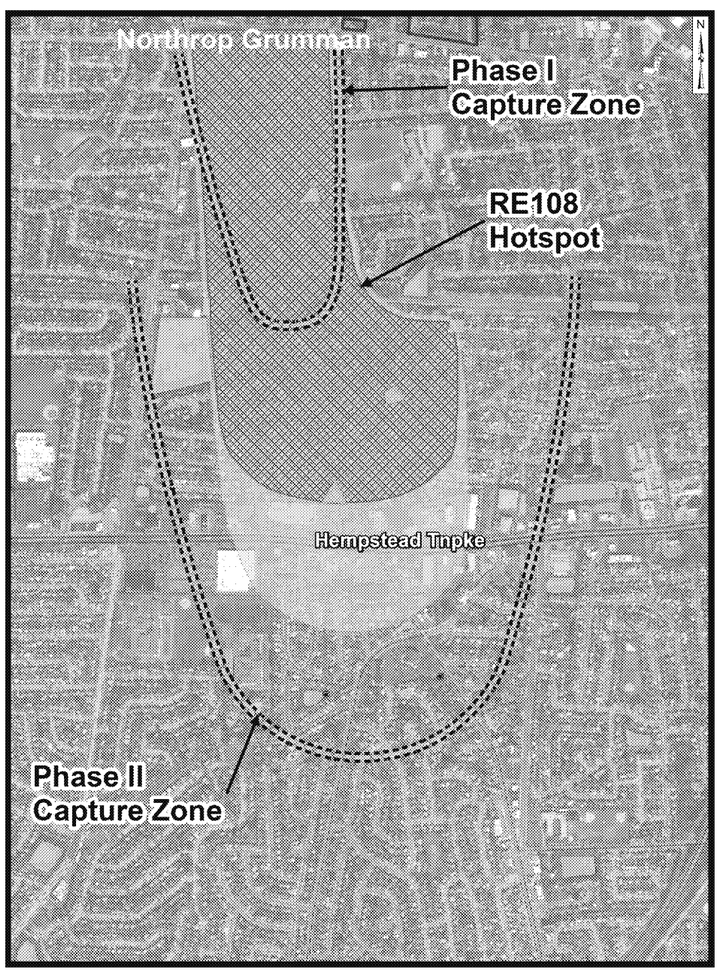

N
PWD-7438
BWD-9591
Bethpage
Levittown
North Massapequa
Legend
Monitoring Well
Vertical Profile Boring
Vertical Profile Boring - Proposed
Water Supply Well
Extraction Well
Extraction Well - Proposed
0
750
1,500
3,000
Feet
USGS The National Map: National Boundaries Dataset, National Elevation Dataset, Geographic Names Information System: National Hydrography Dataset, National Land Cover Database, National Structures Dataset, and National Transportation Dataset; U.S. Census Bureau - TIGER/Line; HERE Road Data

RE108 AREA HOTSPOT TREATMENT SYSTEM

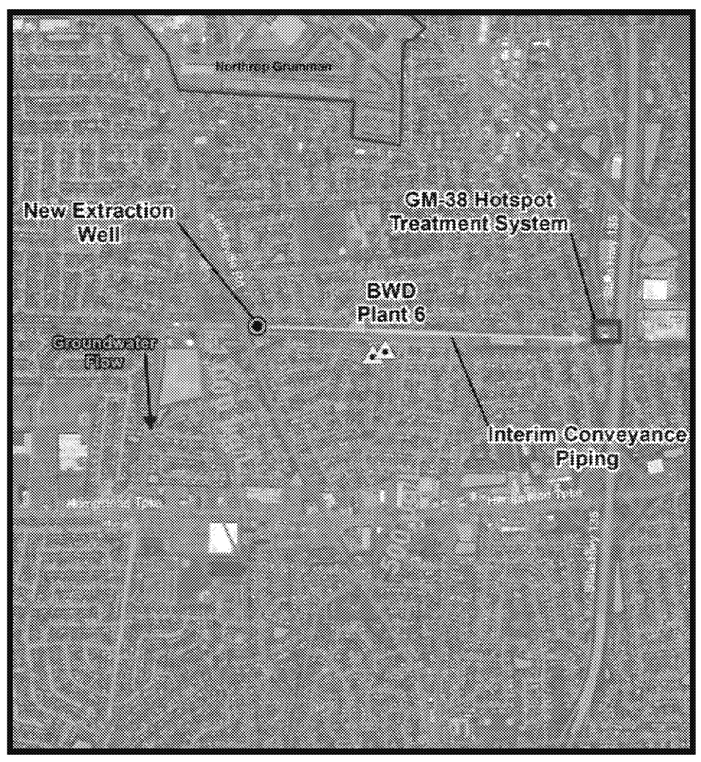
Background

- Navy is addressing the RE108 Area Groundwater Hotspot
- Work is being conducted in 2 phases
  - Phase I located north of Hempstead Turnpike, to address northern portion of the Hotspot
  - Phase II located south of Hempstead Turnpike to address remainder of the Hotspot



Phase I - Description

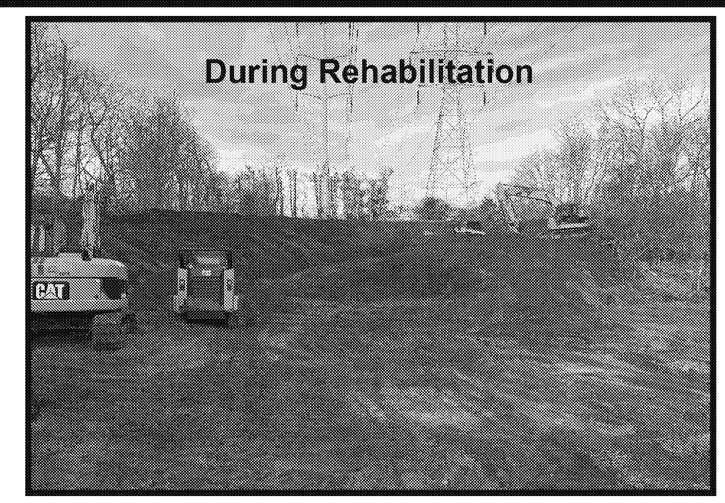
- The Phase I System would consist of an extraction well and double wall piping to the Navy's existing GM38 Area Hotspot Treatment System
- Based on property access requirements, design and construction could be completed within 1.5 years
- Operations would reduce RE108 Area Hotspot groundwater migration rate and remove significant solvent mass from the groundwater
- Its operation would also accelerate overall groundwater cleanup times



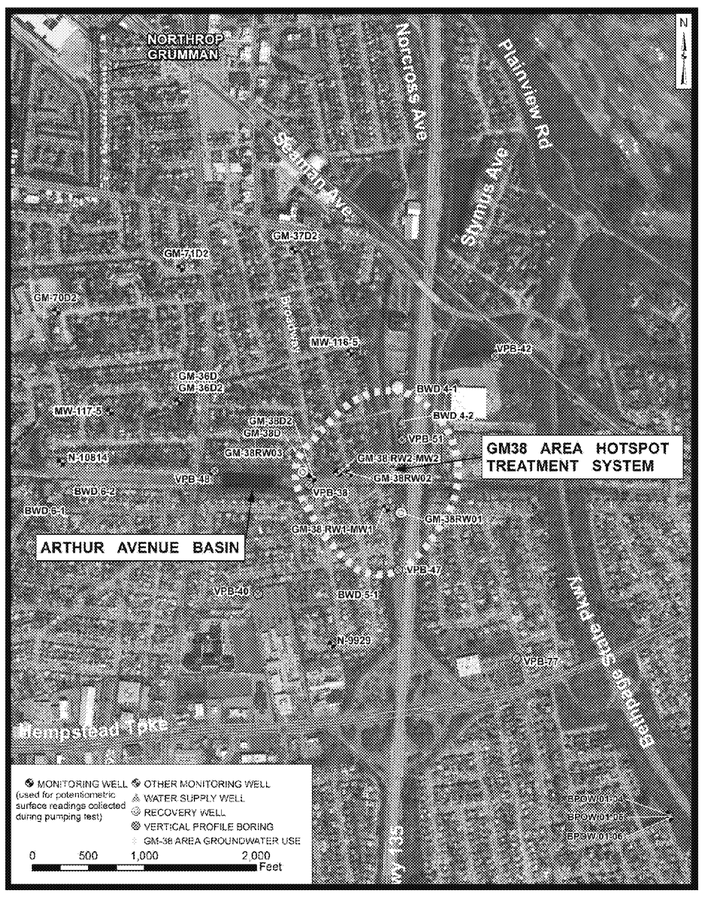
Phase I - Siting

- The new well and piping would use the existing utility corridor and GM38 Area Hotspot Treatment System

GM38 BASIN REHABILITATION

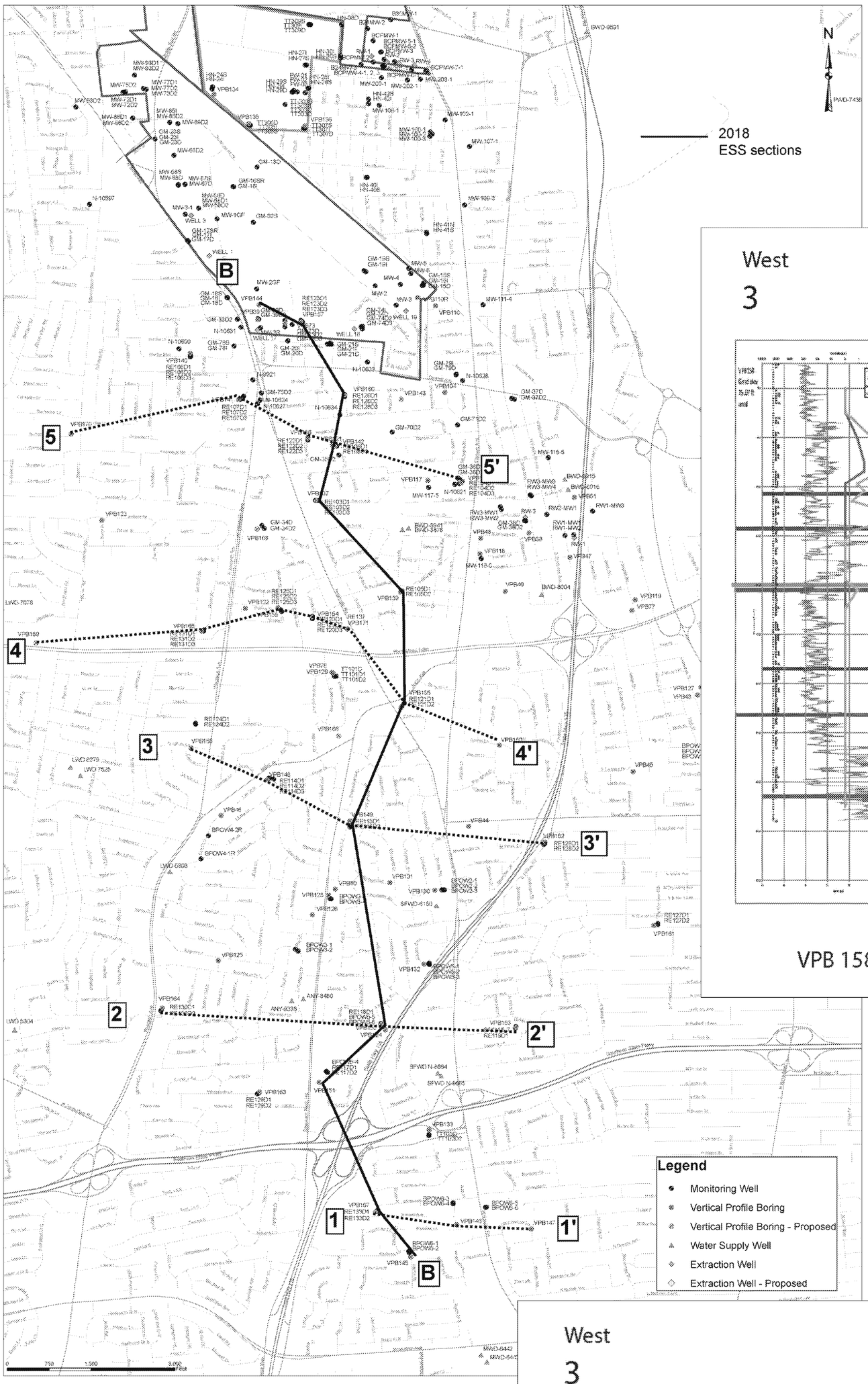


- Navy cleaned basin in the winter of 2018
- Approximately 2,000 tons of soil and trash were removed

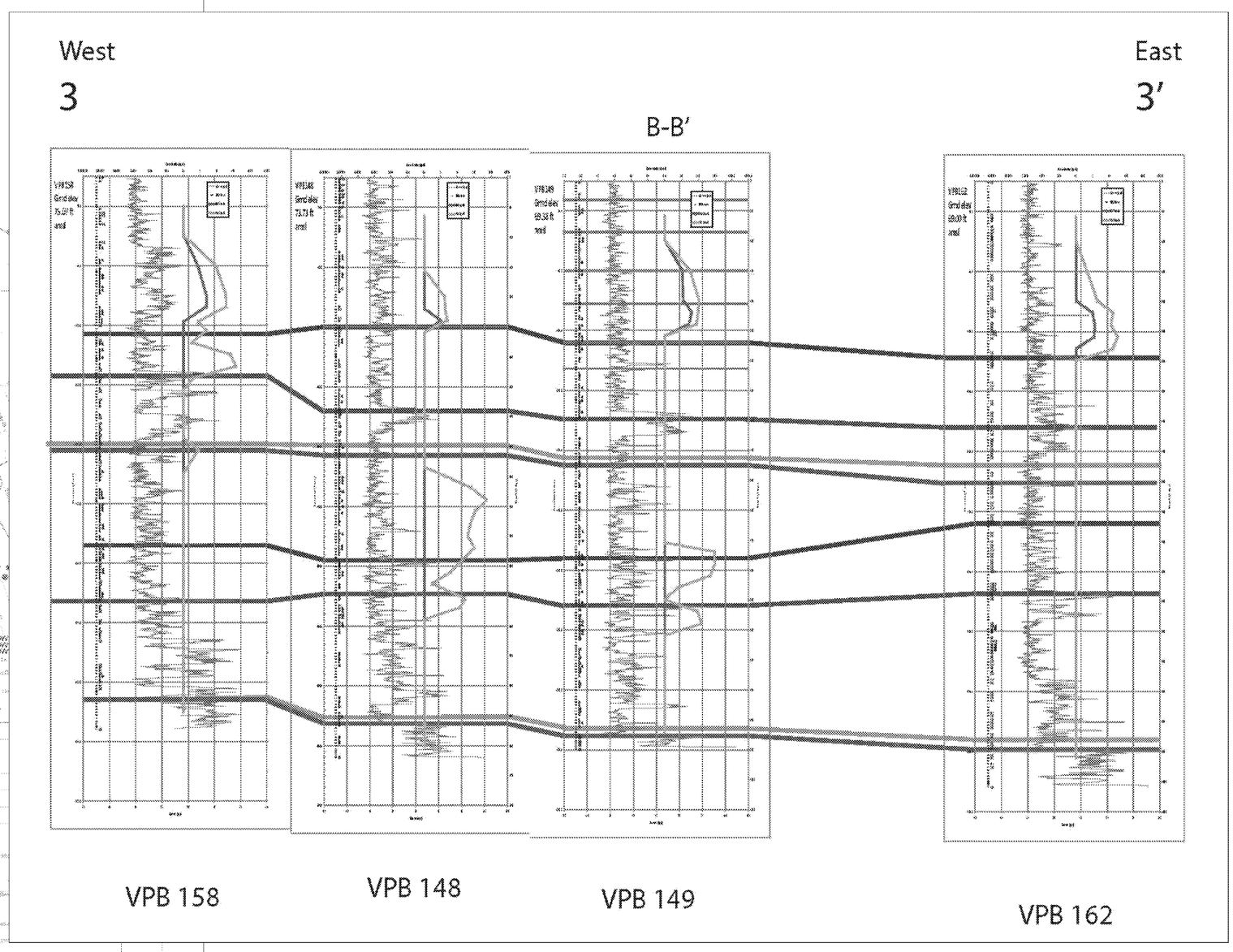


Geologic Cross Sections

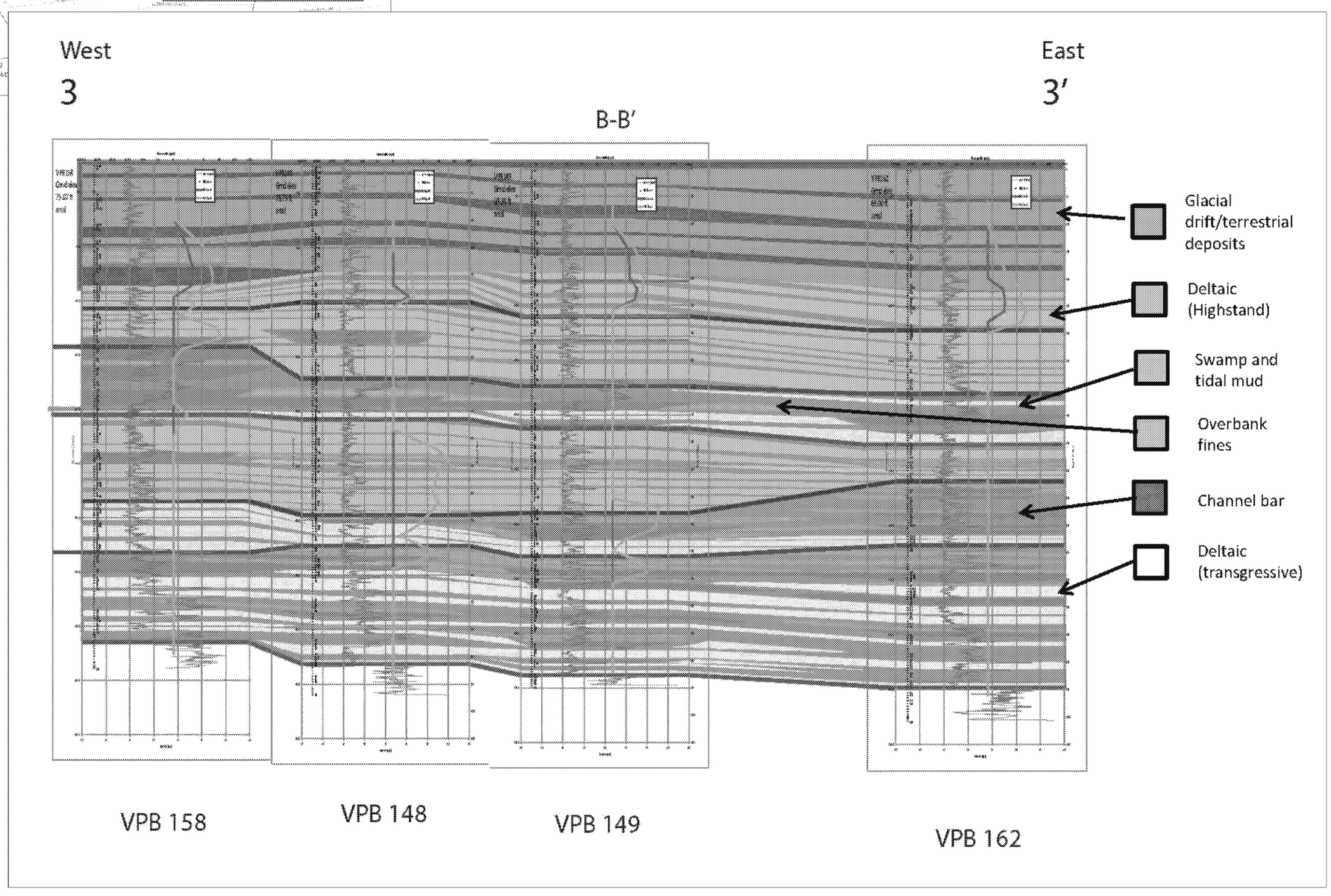
Geologic Cross Sections provide a 3D understanding of the Geology and Plume Migration.



Example:
Magothy Geologic Cross Section -
Understanding the geology of the Plume



Magothy Geologic Cross Section Complexity
Close up



APPENDIX D
PRESENTATIONS

GROUND RULES
APRIL 2018 RESTORATION ADVISORY BOARD (RAB)

NAVAL WEAPONS INDUSTRIAL
RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

4/18/2018

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE RAB GROUND RULES

- Respect others:
  - One Speaker at a time
  - No interruptions
  - No side conversations
  - Listen and stay open to all points of view
- Ask questions or make statements after all the presentations are given: (approximately 8:00)
  - During the presentations, write any questions on the cards on your table and pass them forward, or raise them and they will be picked up and taken to the RAB Community Co-Chair.
  - They will be answered after presentations are completed.
- Stay focused on the topics; avoid digressions.
- Turn cell phones and /or pagers off, or on vibrate, and respond during breaks, except for emergencies.

The Management | Edge

OPERABLE UNIT 2 - OFFSITE GROUNDWATER INVESTIGATION AND WELL RECOVERY EFFECTIVENESS ANALYSES UPDATE

APRIL 2018 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

4/18/2018

PRESENTATION LAYOUT

Is My Water Safe to Drink?

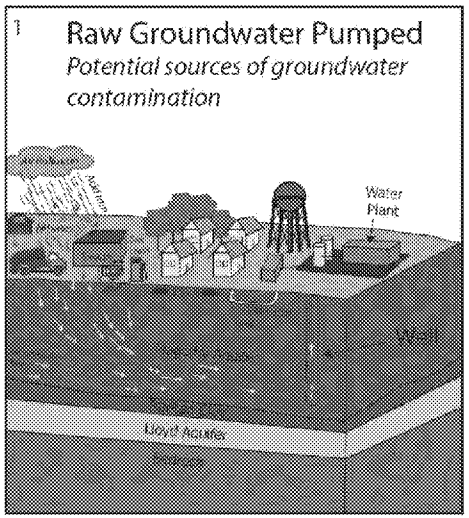
Operable Unit 2

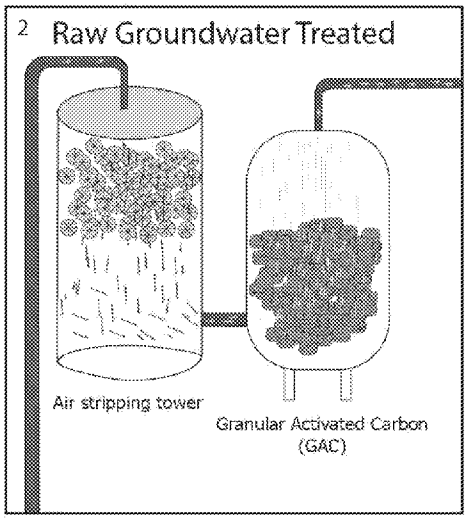
1. Navy's Objectives for OU2 Investigation
2. Local Groundwater Geology and Applicability to Bethpage Plume
3. 2009 – 2018 Vertical Profile Borings and Monitoring Wells
4. Recent Work (Performed since last Restoration Advisory Board)
5. Future Work
6. Assessing Results and Recent Reports and Findings

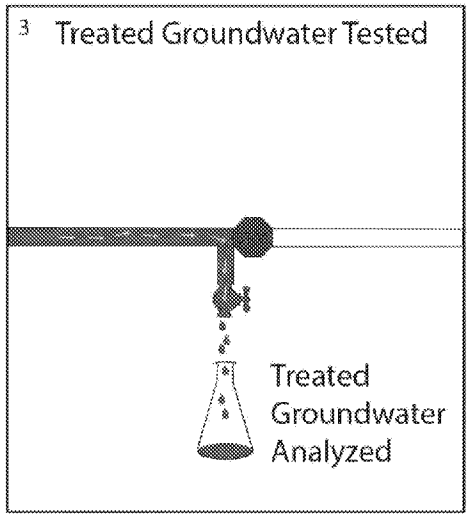
Well Recovery Evaluation

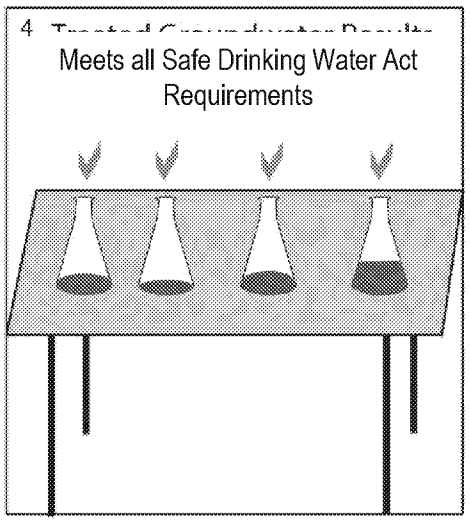
1. Update – New York American Water (NYAW) and South Farmingdale Water District (SFWD) Plant 6 Wells

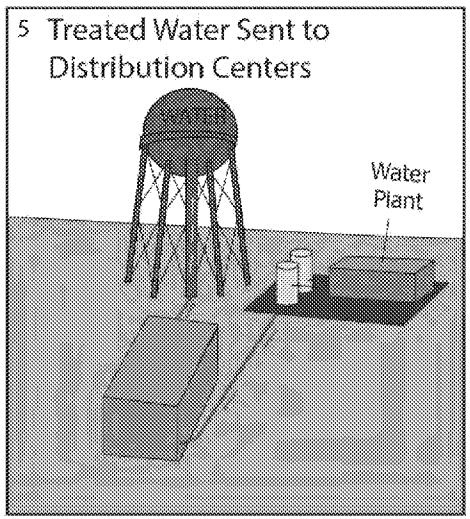
IS MY WATER SAFE TO DRINK?
THE ANSWER IS YES

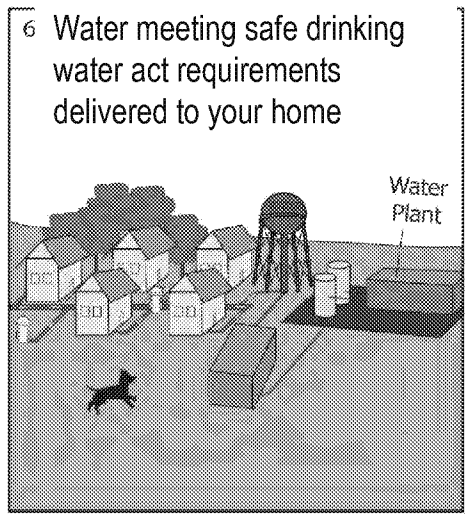




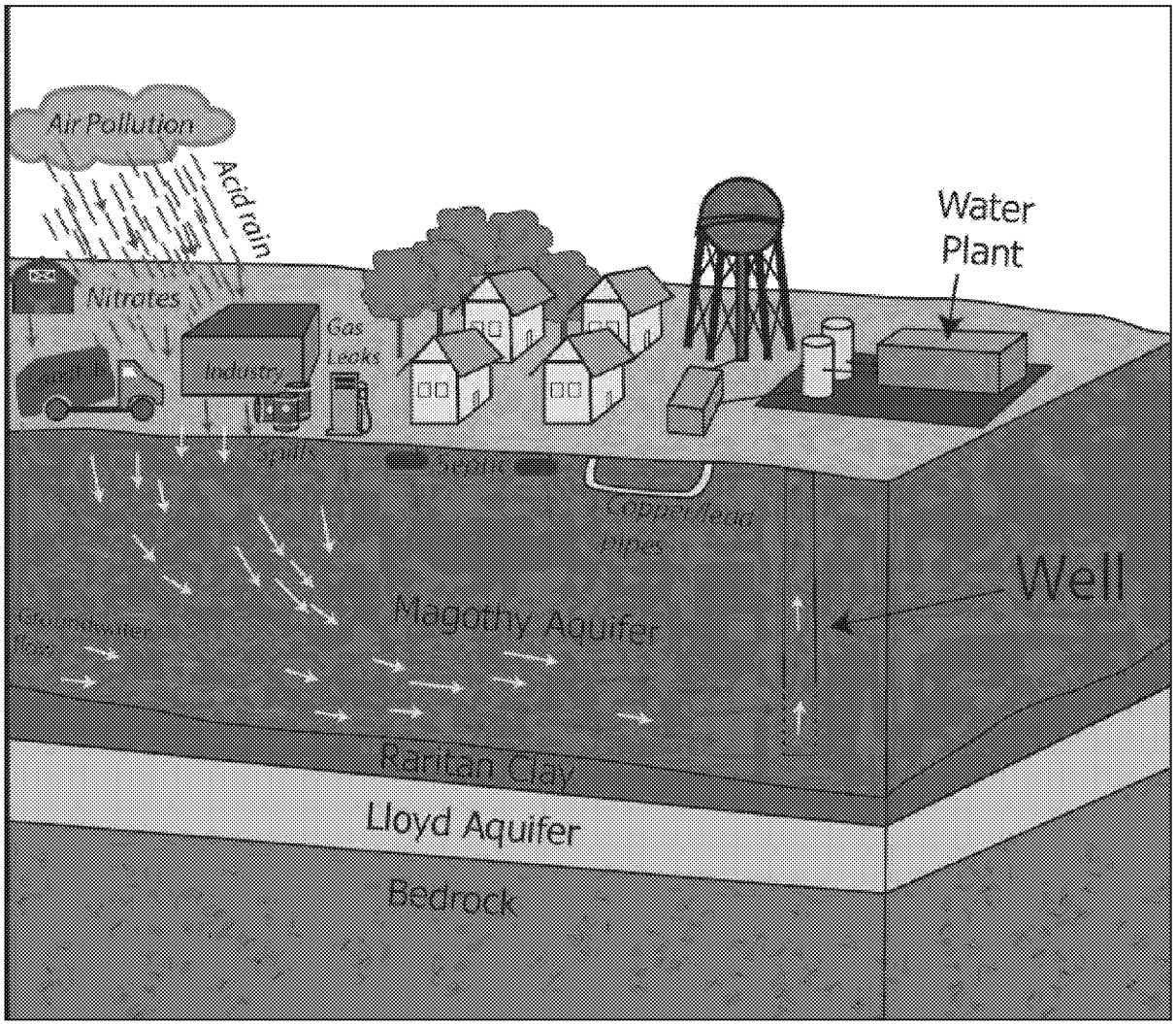




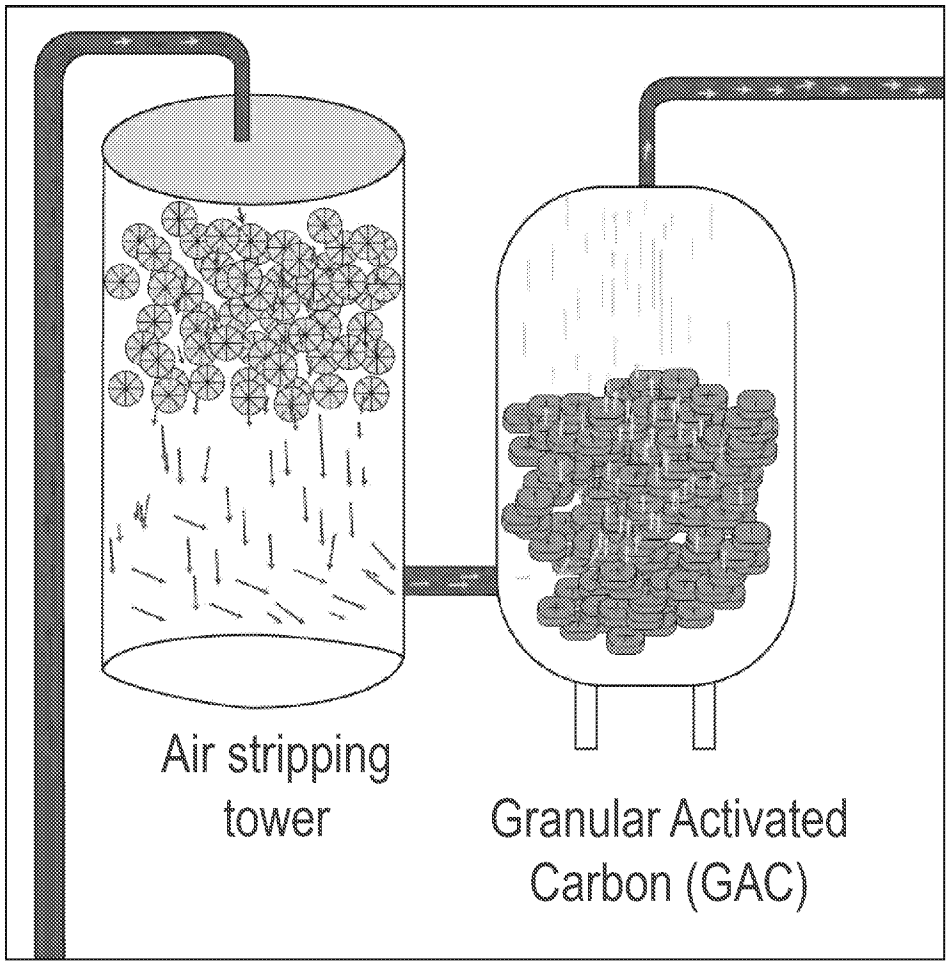




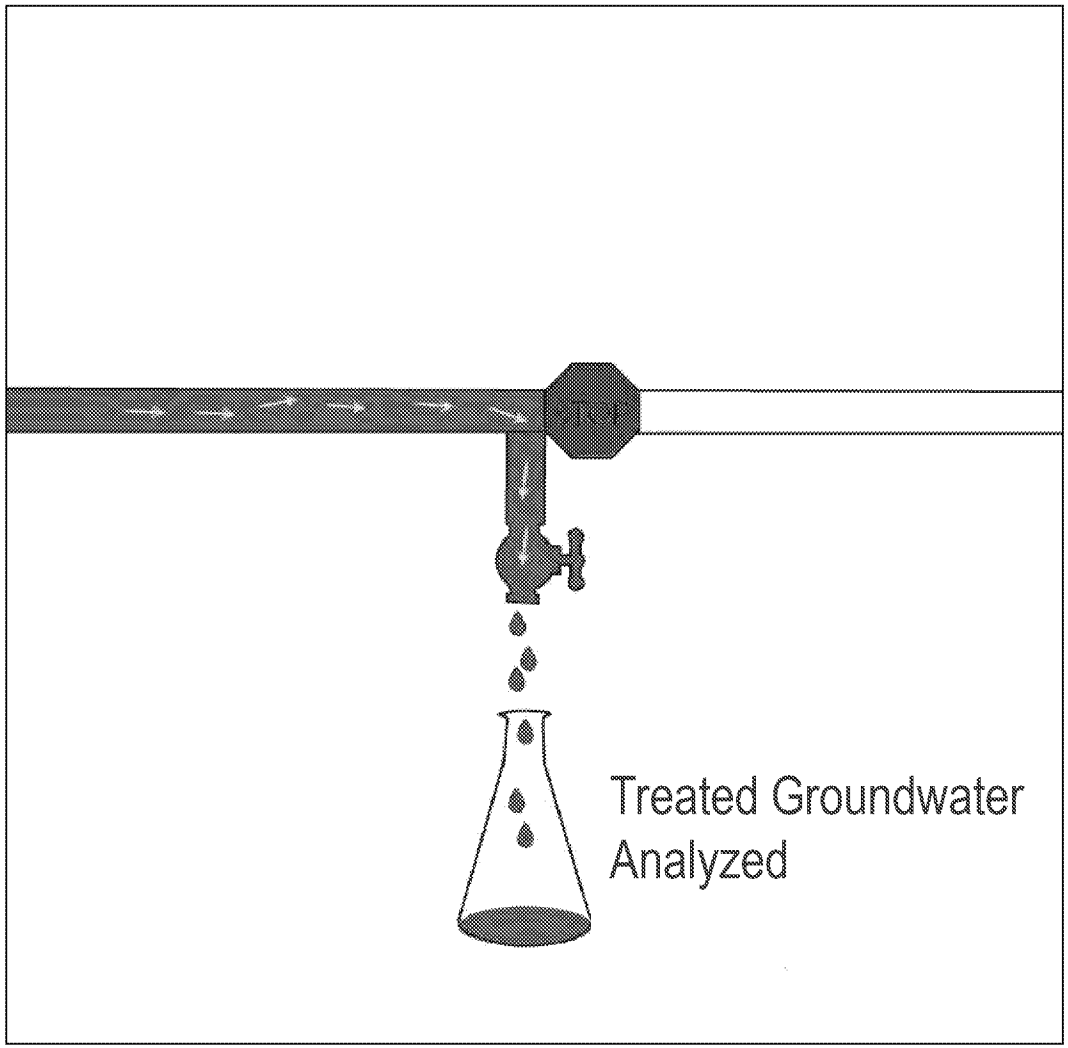
RAW GROUNDWATER PUMPED MAY CONTAIN CONTAMINANTS



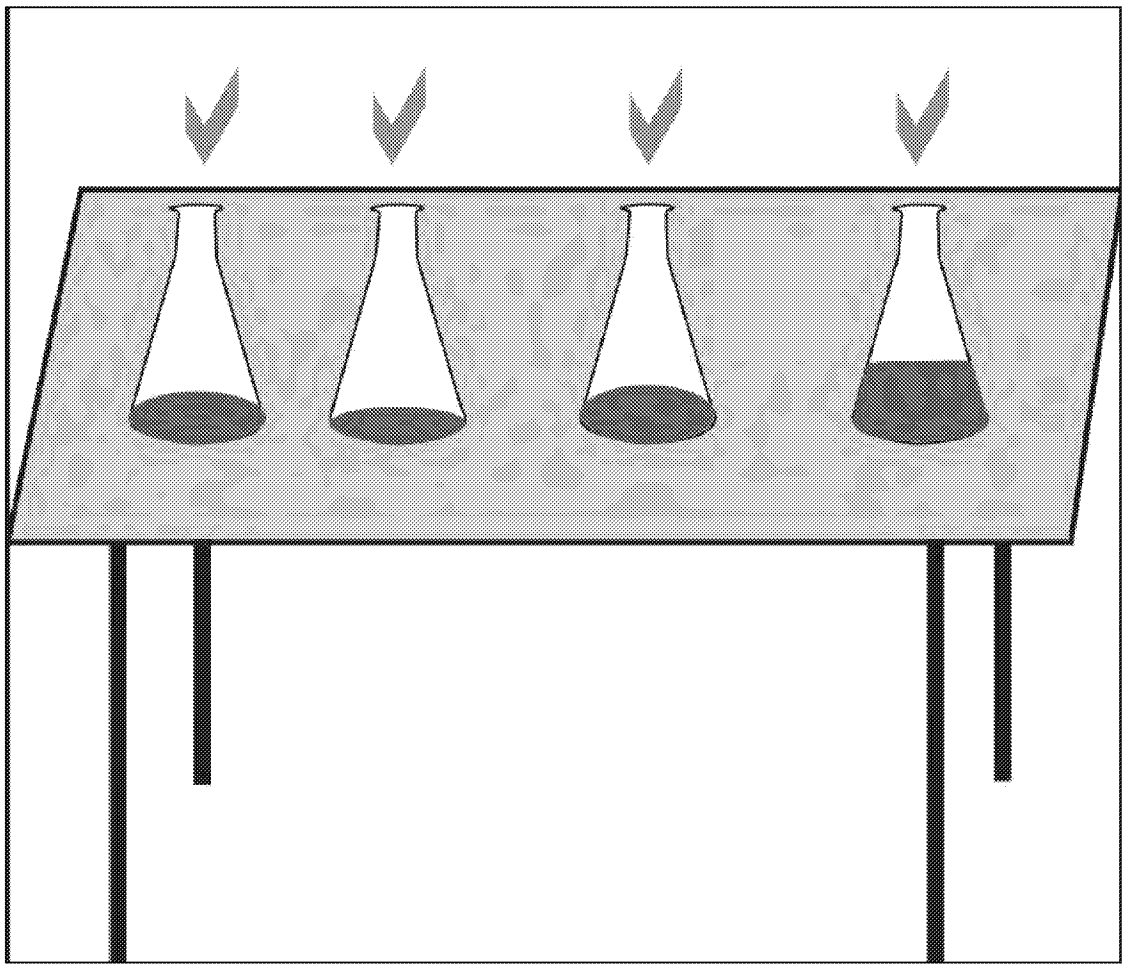
RAW GROUNDWATER TREATMENT FOR VOLATILE ORGANIC COMPOUNDS (VOC's)



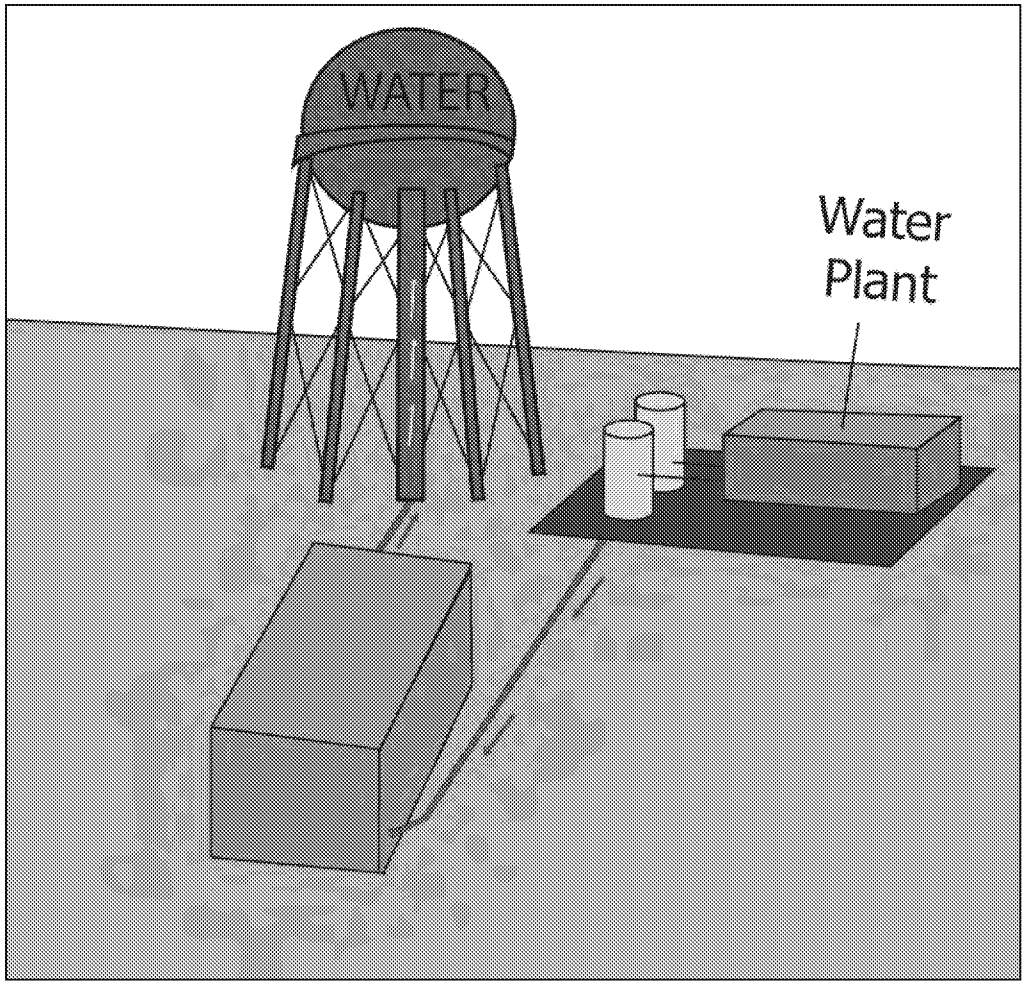
TREATED GROUNDWATER TESTED



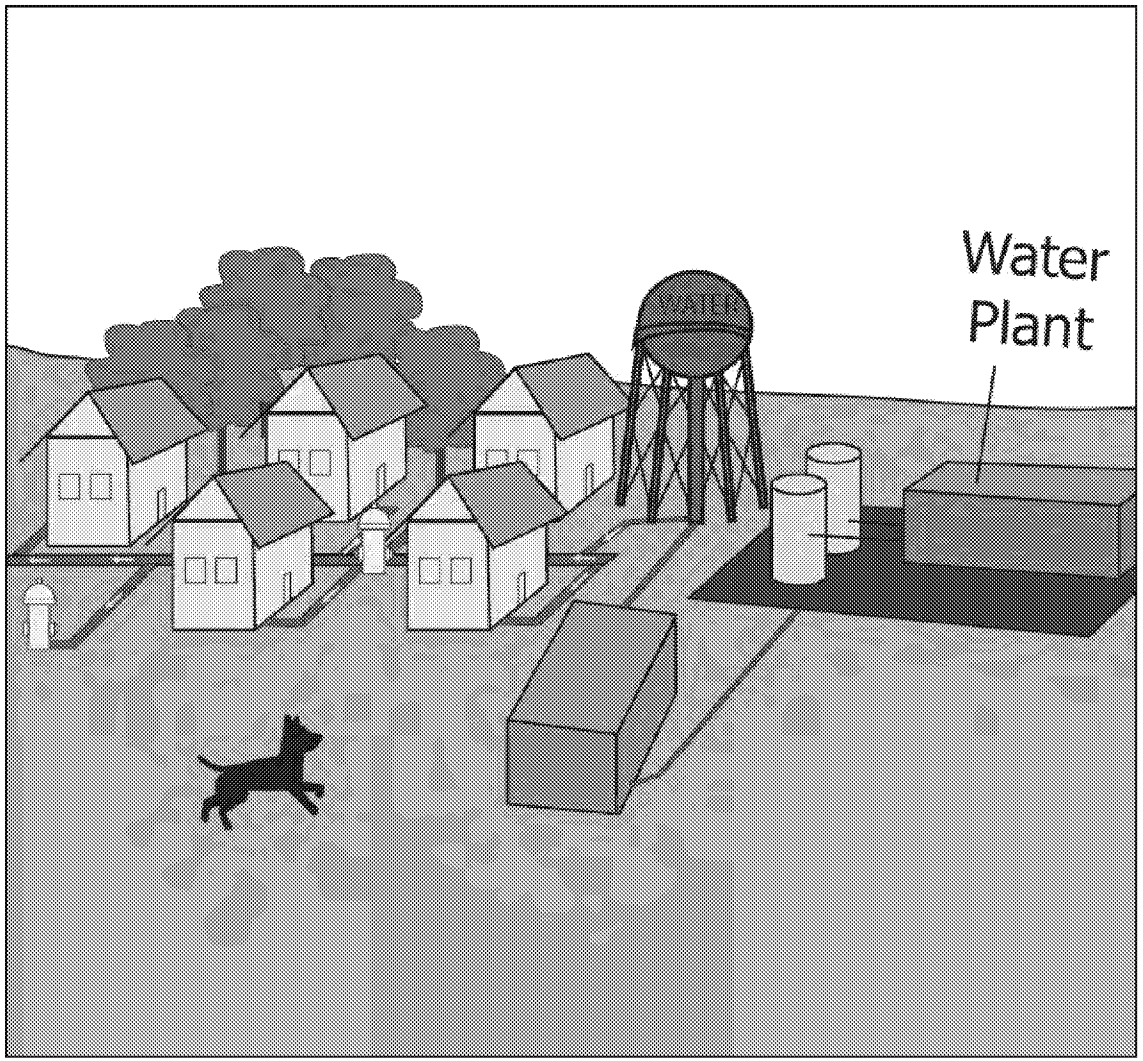
TESTING CONFIRMS TREATED GROUNDWATER MEETS ALL SAFE DRINKING WATER ACT REQUIREMENTS



TREATED WATER IS THEN SENT TO DISTRIBUTION CENTERS



WATER MEETING SAFE DRINKING WATER ACT REQUIREMENTS ARE DELIVERED TO YOUR HOME



THE NAVY'S OBJECTIVES FOR THE OFFSITE GROUNDWATER INVESTIGATION

1. **Protection of public water supply wells –**
   - All currently planned outpost and monitoring wells are in place and being monitored quarterly.
2. **Continue to Investigate the OU2 Plume –**
   - Installation of Monitoring Wells and Vertical Profile Borings to delineate the overall plume and the RE108 Hotspot; *Very complicated geology influencing plume migration, requiring intensive investigation*
   - Quarterly groundwater sampling to determine contaminant trends and plume migration.
3. **Investigate how well supply wells recover contamination at the leading edge of offsite plume-**
   - Develop groundwater model with pumping data from South Farmingdale Water District (SFWD) and New York American Water (NYAW);
   - Aquifer testing and analysis of test recovery well RE137 in the area southwest of Bethpage Water District (BWD) Well 6-2 (completed March 2018) to support the groundwater modeling.

OFFSITE GROUNDWATER INVESTIGATION – *What are the parts?*

Purpose: Identify groundwater contamination in areas south of Naval Weapons Industrial Reserve Plant Bethpage – *Information will be used to chart the path to successful cleanup of offsite plume*

Program Components:

- **Vertical Profile Borings (VPB)** - quickly screen areas for the presence, depth, and concentration of contamination; drilling can take 4-8 weeks to complete
- **Installation/Sampling of Permanent Monitoring Wells** - confirm presence/absence of contamination and develop trends; drilling can take 2-6 weeks to complete
- **Data Logging of Water Levels and Evaluation of Data** - support groundwater modeling and effectiveness of recovery wells

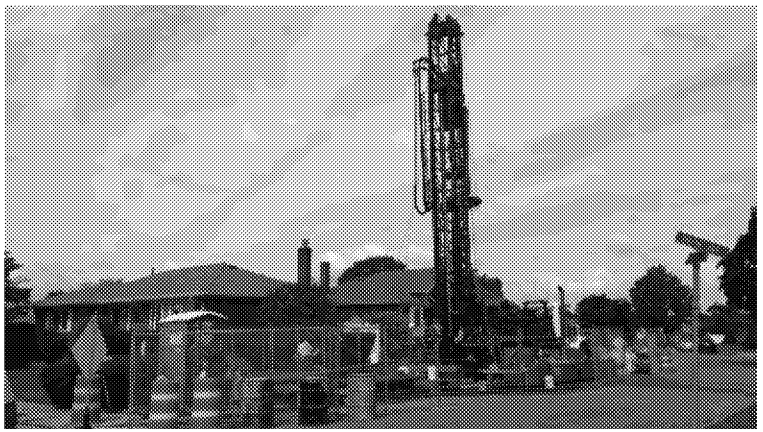
VERTICAL PROFILE BORINGS (VPB) AND WELLS – *What are they and how are they used?*

- **Vertical Profile Boring - 12-inch** diameter hole drilled into the ground;
- Final boring is **860 to greater than 1,000** feet deep (extending to the Raritan Clay Layer, the bottom of the main Long Island Aquifer);
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater;
- **On average, 44 groundwater samples** are collected per boring and analyzed for Volatile Organic Compounds;
- **Permanent wells** at different depths are then installed at the VPB location to verify the VPB results and to continue monitoring of the plume;
- **It usually takes 4 to 8 weeks** to complete a VPB or well.

VPB AND WELL INSTALLATION PROCESS – *How are locations chosen?*

Process:

- Ideal map location selected by Navy and State;
- Location is then ground-proofed (visual check onsite) by the Navy;
- Drilling rig requires minimum of 100 feet with no overhead obstructions;
- Municipal properties preferred (drainage basins or township right of ways);
- Considerations to minimize inconvenience to residents nearby:
  - Health and Safety Concerns
  - Getting in and out of neighborhoods
  - Noise – operate on weekdays 8 to 5
- Process includes advanced notification to nearest residence

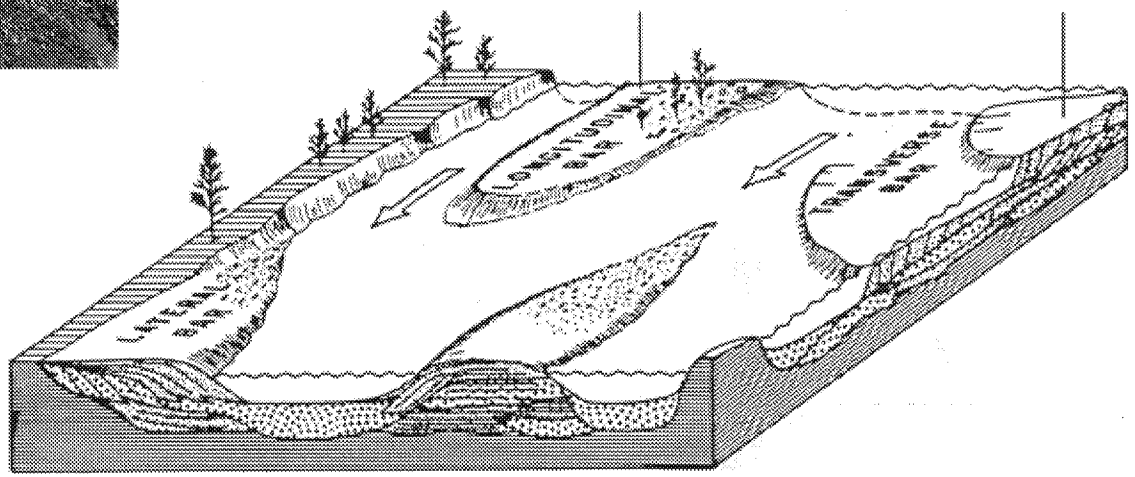


LOCAL GROUNDWATER GEOLOGY – *How does this affect plume migration?*

BASAL MAGOTHY AQUIFER

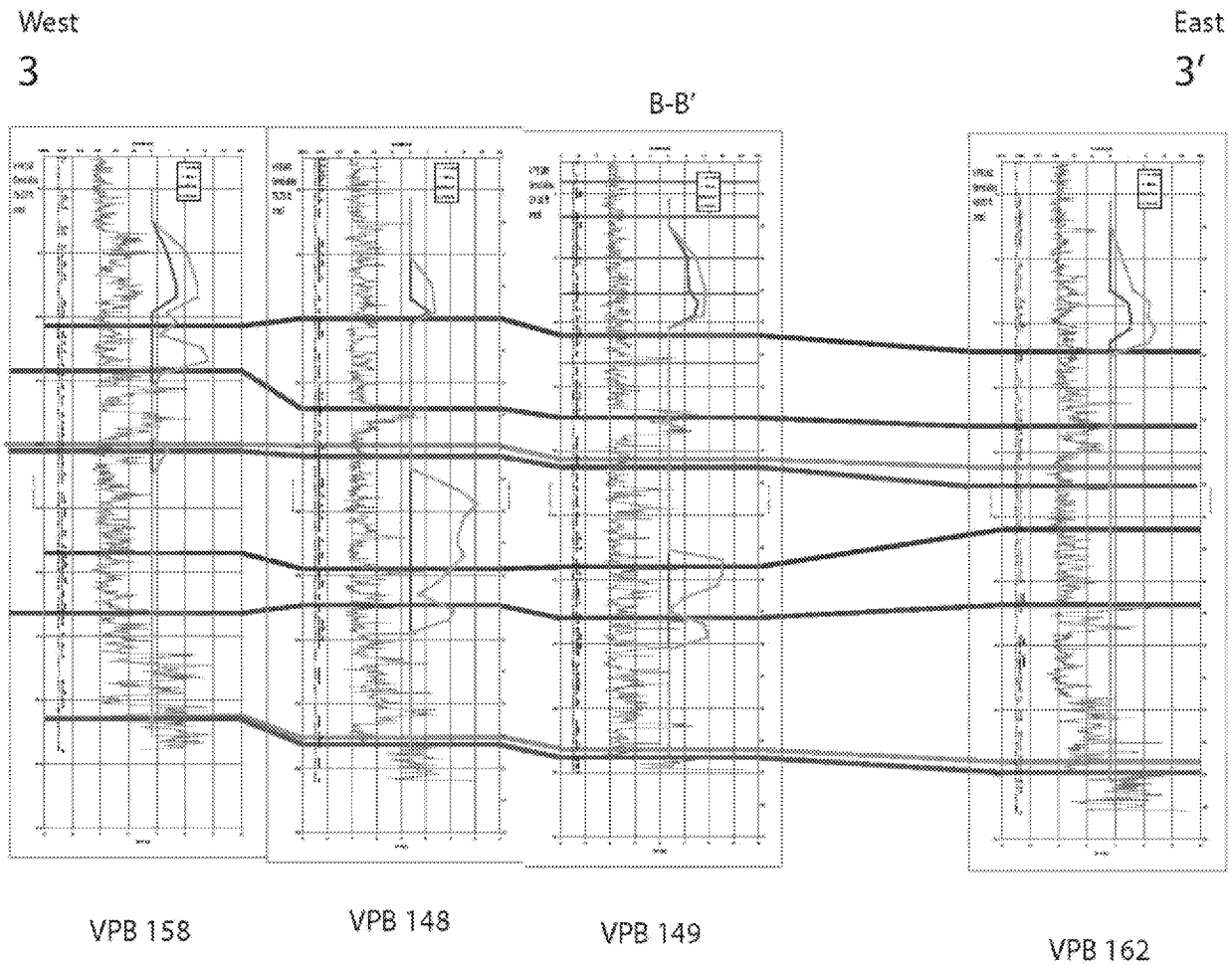
Interbedded clays, sands, and gravels

Geologic layers are not the same at each location



MAGOTHY GEOLOGIC CROSS SECTION –
Understanding the geology and the offsite plume

The geology can be separated into layers that correspond to contaminant concentrations. These are used to identify the location and migration of the plume.

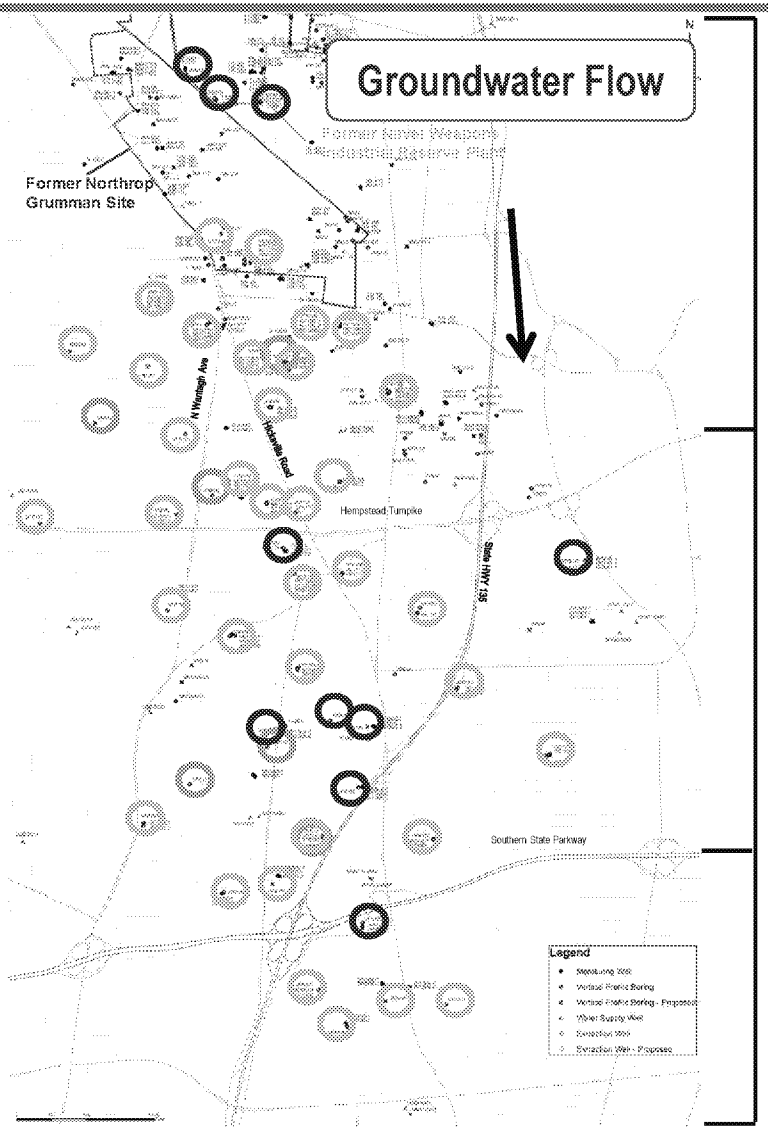


VERTICAL PROFILE BORINGS AND WELLS –
What has been done by the Navy?

2009
Completed
(green)

2010 to 2012
Completed
(blue)

2012 to 2018
Completed
(orange)



North of Hempstead
Turnpike Area

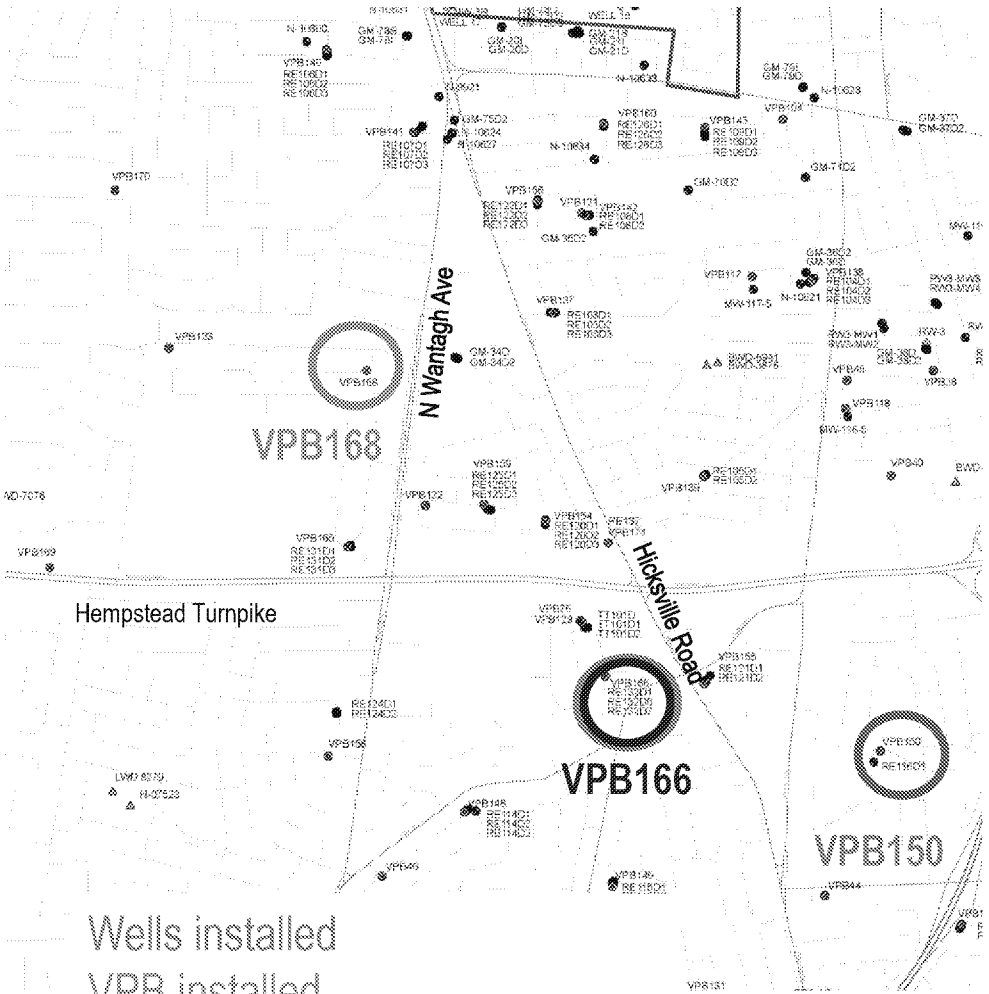
North of Southern State
Parkway Area

South of Southern State
Parkway Area

WORK PERFORMED SINCE THE LAST RAB - *VPBs and Wells*

From November 2017 (last RAB) to present

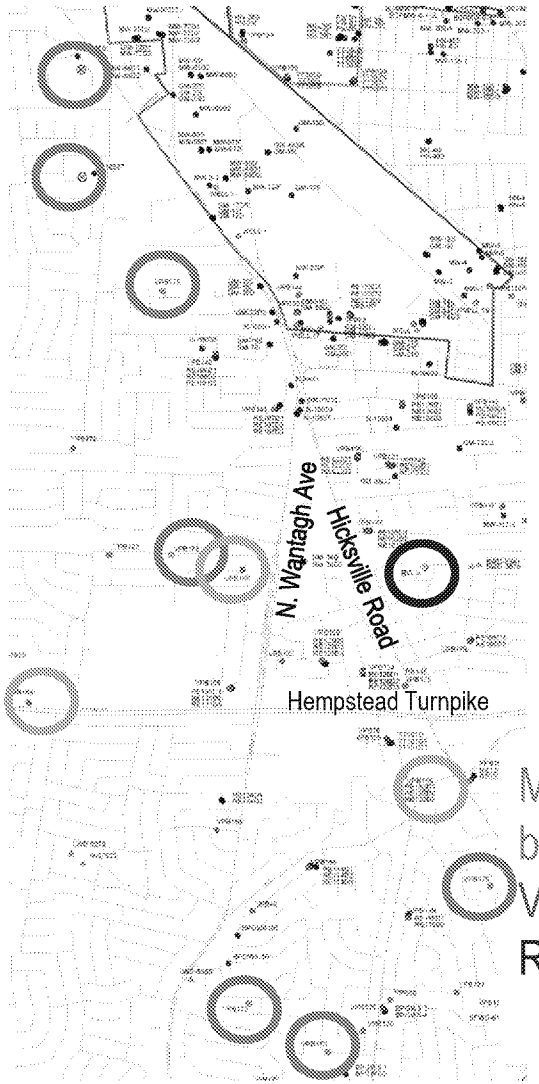
- Operation of 1 drilling rig
- South of Hempstead Turnpike
  - Installation of two monitoring wells associated with VPB166 and one monitoring well associated with VPB150
  - Currently installing RE137D5 (VPB166 location)
- North of Hempstead turnpike
  - Installation of one VPB (VPB168)
- Completion of 2 rounds of quarterly groundwater sampling (December 2017 and March 2018)
- Completion of 2 rounds of water level measurements in December and March.



FUTURE WORK
VERTICAL PROFILE BORINGS & MONITORING WELLS

Planned work through March 2019:

- Operation of 2 drilling rigs
- Installation of Vertical Profile Borings
  - 4 north of Hempstead Turnpike Area (To be sited),
  - 3 north of Southern State Parkway Area (To be sited)
- Installation of Monitoring Wells
  - 7 north of Hempstead Turnpike Area
  - 4 north of Southern State Parkway
- Installation of 1 Recovery Well and associated VPB North of Hempstead Turnpike (To be sited)



ASSESSING GROUNDWATER RESULTS – *How do we use this information?*

Laboratory analysis is performed on groundwater samples for multiple volatile organic compounds (VOC's).

The primary VOC being used to track the plume is trichloroethene (TCE) because it is present in the plume at the highest concentrations.

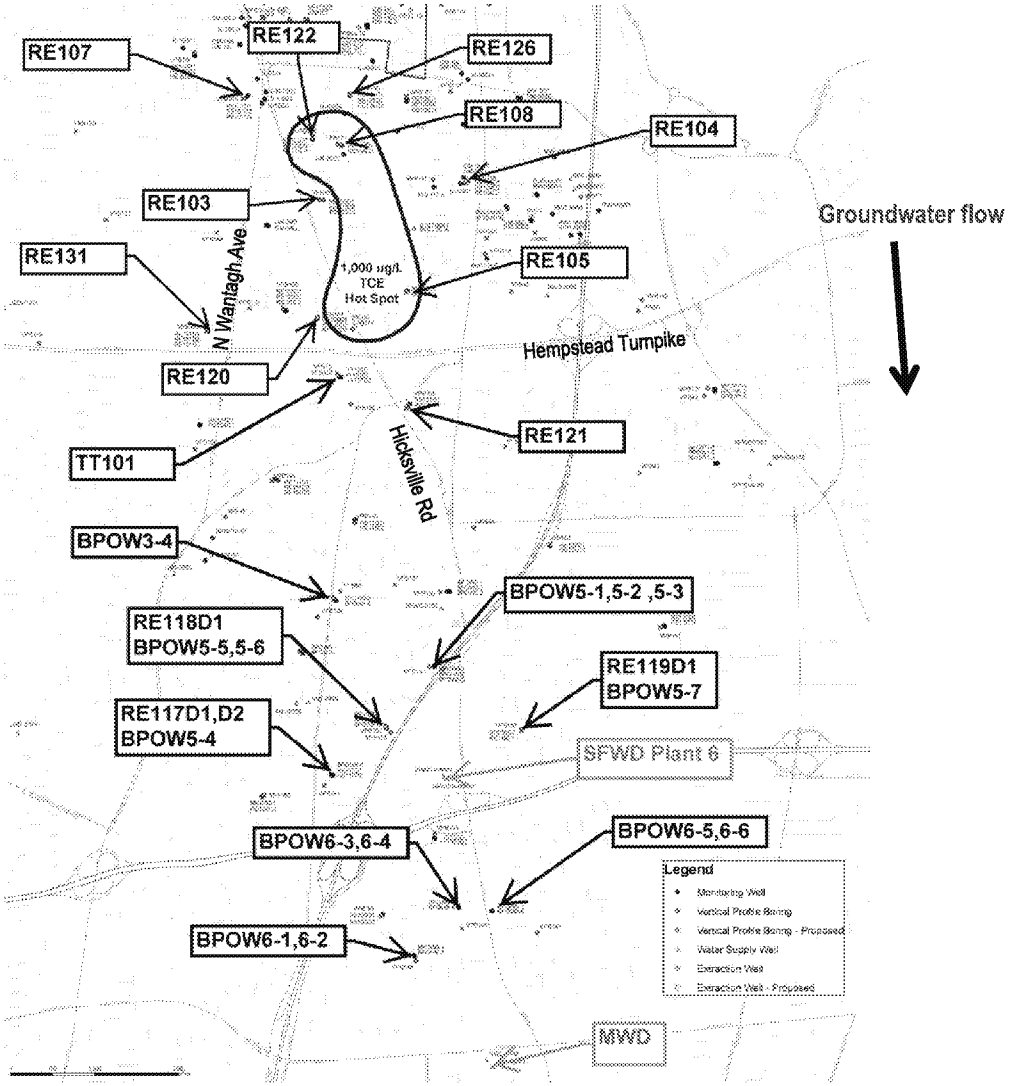
- The Maximum Contaminant Limit (MCL) for TCE is a limit established by Federal and State regulations;
- The MCL for TCE is 5 parts per billion;
- A "Hotspot" as defined in the Operable Unit 2 Offsite Groundwater 2003 Record of Decision is an area of groundwater with >1,000 parts per billion of total VOC's.

INDEX MAP OF TREND ANALYSIS WELLS - *What is the plume doing?*

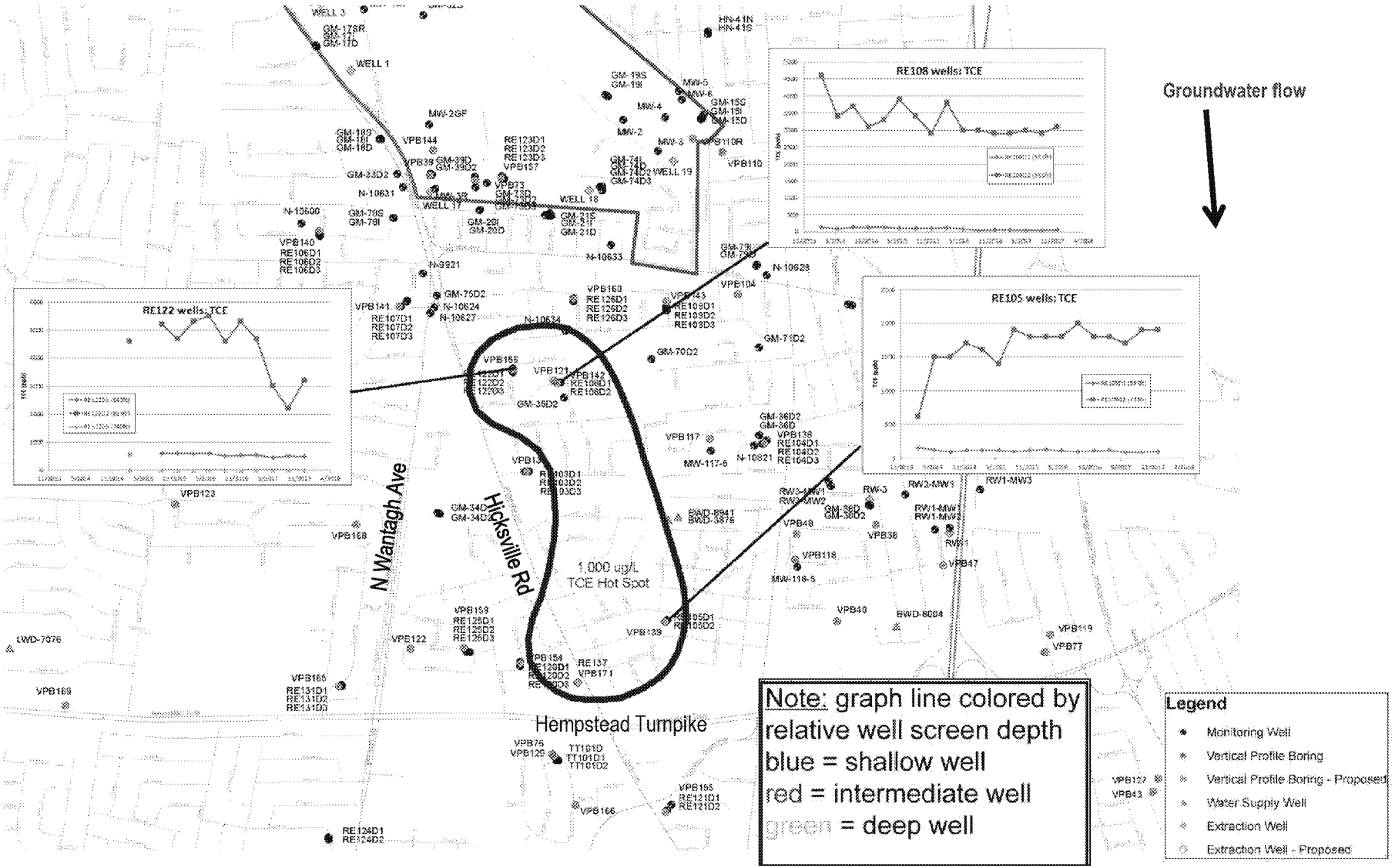
Questions

- What's happening inside RE108 Hotspot?;
- What's happening near the outside of the RE108 Hotspot?;
- What's happening with the downgradient outpost wells?

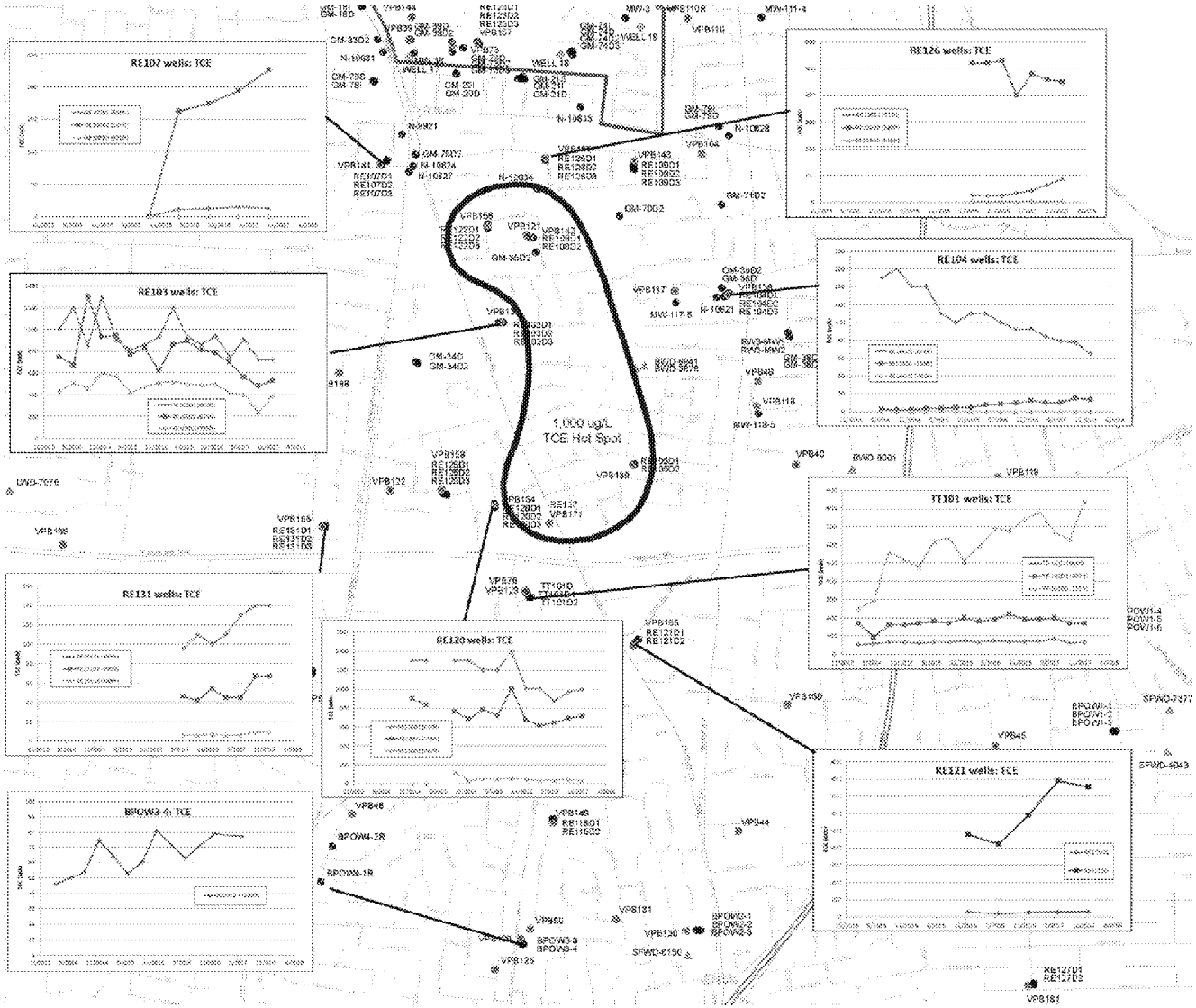
Here's a set of wells to look at each of those questions



TRENDS INSIDE THE RE108 HOTSPOT FROM QUARTERLY GROUNDWATER SAMPLING



TRENDS OUTSIDE THE RE108 HOTSPOT FROM QUARTERLY GROUNDWATER SAMPLING



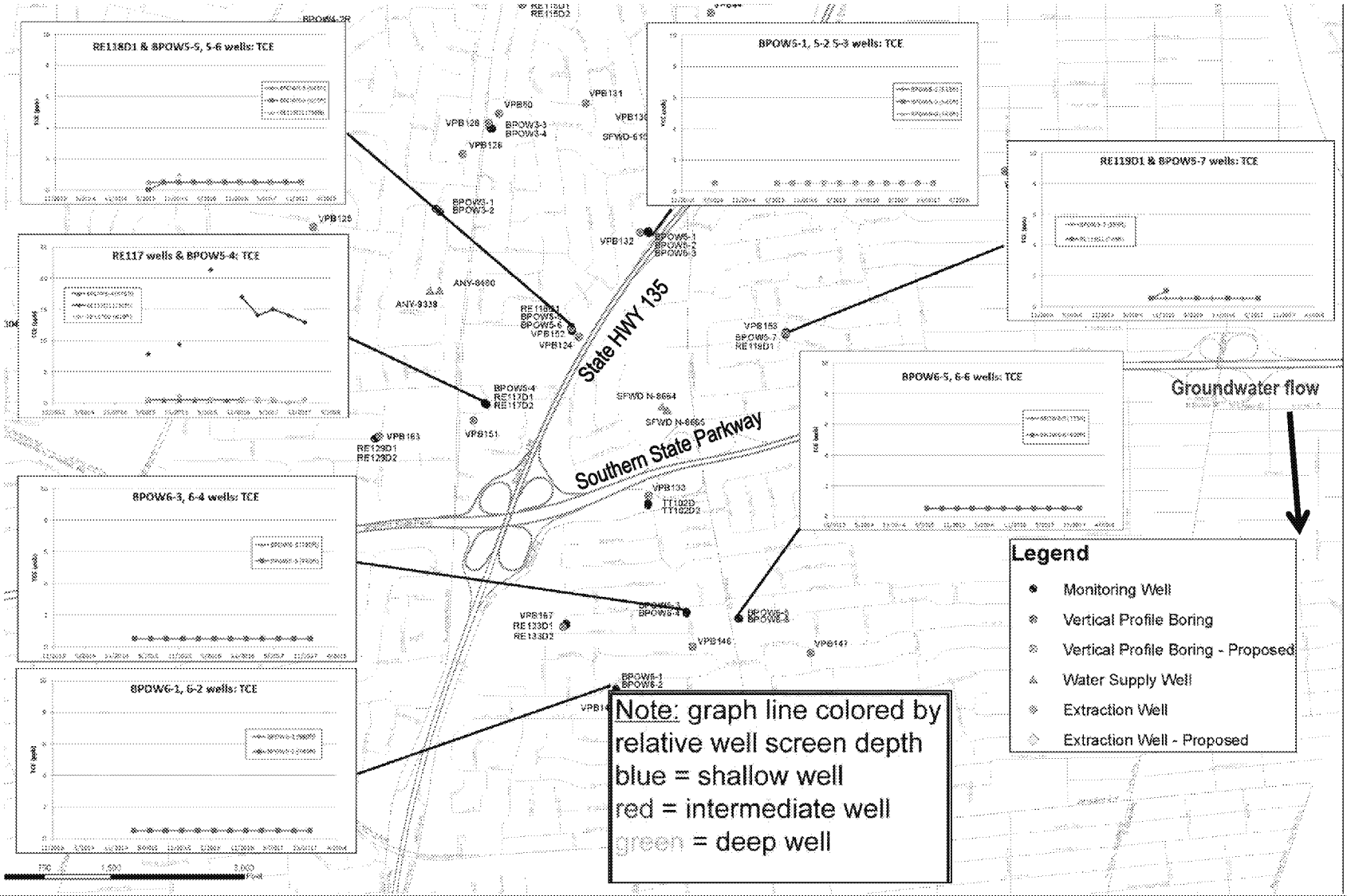
Groundwater flow

Note: graph line colored by relative well screen depth
blue = shallow well
red = intermediate well
green = deep well

Legend

- Monitoring Well
- Vertical Profile Boring
- Vertical Profile Boring - Proposed
- Water Supply Well
- Extraction Well
- Extraction Well - Proposed

OUTPOST WELLS TRENDS SOUTH OF THE RE108 HOTSPOT FROM QUARTERLY GROUNDWATER SAMPLING



NAVY'S OU2 GROUNDWATER OBJECTIVES RESULTS – *Where are we?*

- **Results:**

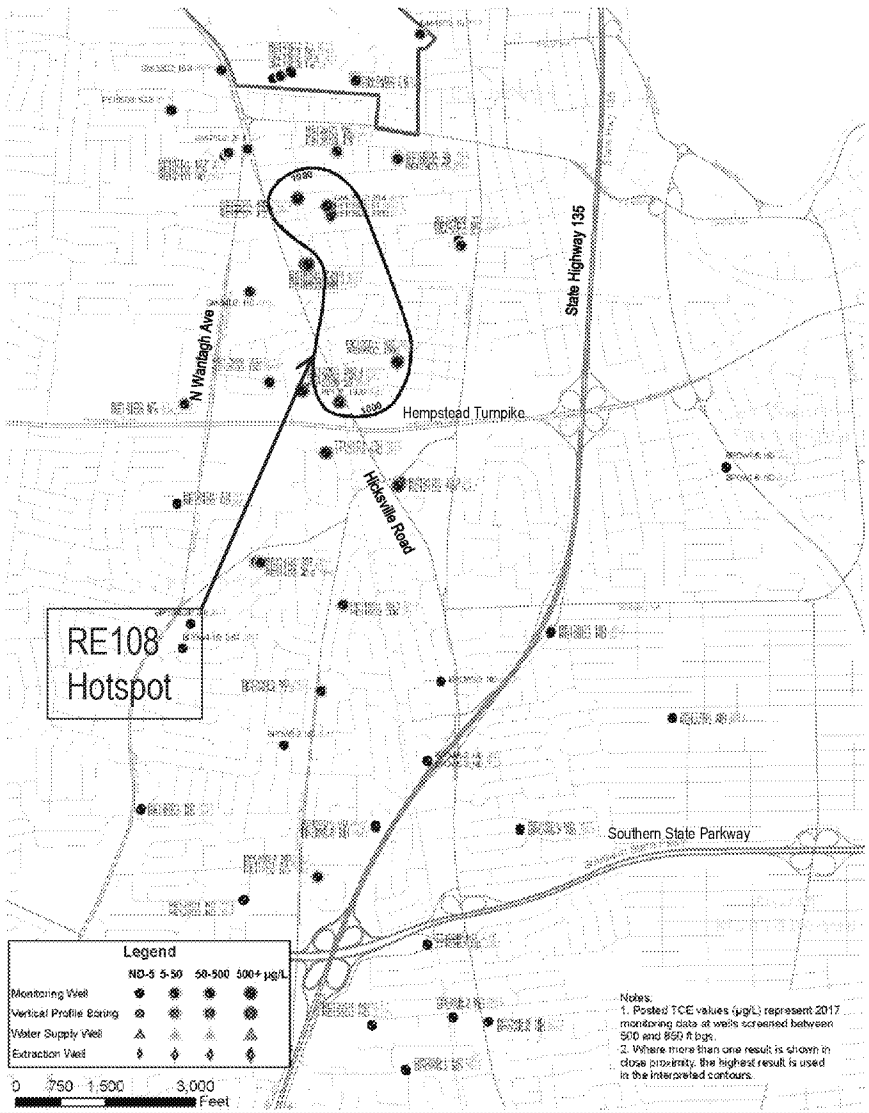
Objective 1 – Protection of Public Water Supply Wells:
Outpost wells installed and are sampled regularly.

Objective 2 – Characterization of the OU2 Plume:

- RE108 Hotspot has been delineated and tracked by Navy drilling and regular sampling program;
- Trichloroethene found above 1,000 parts per billion in the area North of Hempstead Turnpike Area at depths greater than 600 feet;
- Ongoing VPB and well installation to complete delineation of overall plume;
- Ongoing quarterly groundwater sampling to continue tracking of the off site plume.

Objective 3 – Well Recovery Evaluation Analysis:

- Treatment options are being evaluated to address potential impacts to public water supply wells and to address RE108 Hotspot.



WELL RECOVERY EVALUATION ANALYSES – *Use of existing wells for groundwater cleanup*

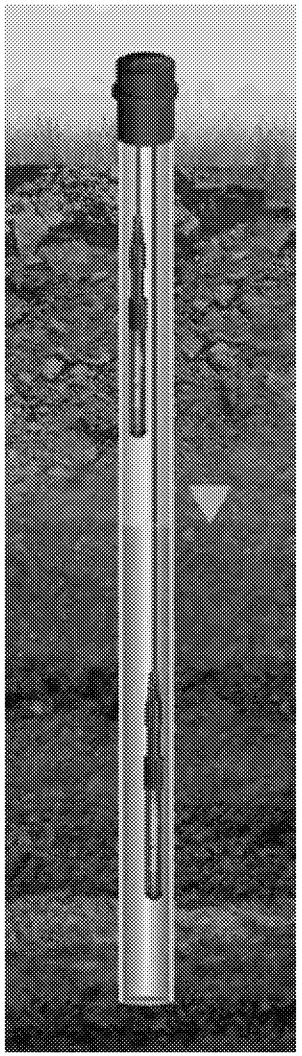
Well Recovery Evaluation (How wells influence groundwater flow):

1 – SFWD Plant 6 Wells and NYAW Wells: Groundwater modeling is being conducted to determine their ability to recover OU2 contamination – completion of the groundwater modeling is expected in Fall of 2018

2 – Testing of Recovery Well RE137 (within the RE108 Hotspot north of Hempstead Turnpike)– extensive aquifer testing has been completed, which gives us an understanding of the Long Island Aquifer for the purpose of groundwater cleanup.

SOUTH FARMINGDALE WATER DISTRICT & NEW YORK AMERICAN WATER WELL RECOVERY ANALYSIS

- Purpose of work is to identify the well recovery zones of the South Farmingdale Water District (SFWD) Plant 6 wells and the New York American Water (NYAW) wells
- Pumping data from these wells has been received from the New York State Department of Environmental Conservation (NYSDEC);
- February 2017 – May 2017 - water level changes were recorded in key wells south of Hempstead Turnpike to correlate with the received pumping data;
- Groundwater modeling is being conducted using this pumping data and will be completed in Fall of 2018;
- Results will be used to determine how these wells can be used for the for recovery of offsite groundwater.



GM38 AREA HOTSPOT TREATMENT SYSTEM - RECHARGE BASIN REHABILITATION AND INJECTION WELL TESTING

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NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

04/18/2018

GM38 AREA HOTSPOT TREATMENT SYSTEM

- GM38 Area Hotspot Treatment System has been operating since 2009.
- Extracts, treats, and discharges approximately 1.4 million gallons per day (MGD) of groundwater
- Since start up, approximately 11,000 pound of solvents have been removed from the groundwater
- The groundwater is treated with air stripping and granular activated carbon prior to discharge to NC Basin 495
- The off gas is treated with granular activated carbon prior to discharge
- In support of the Phase I RE108 Area Hotspot extraction system:
  - NC Basin 495 was scraped to improve infiltration
  - Injection Well - IW 01 was evaluated during the Basin scraping outage

GM38 AREA HOTSPOT TREATMENT SYSTEM BASIN SCRAPING

- Treatment system was shutdown on January 11, 2018
- Basin was allowed to drain and the sediments to dry
- Soil testing was conducted in January 2018 to determine reuse/disposal requirements
- Cleanup and dredging activities were conducted from January 19, 2018 to March 9, 2018


Basin 495, January 2018

GM38 AREA HOTSPOT TREATMENT SYSTEM BASIN SCRAPING

- Initial scraping of the basin in February 2018

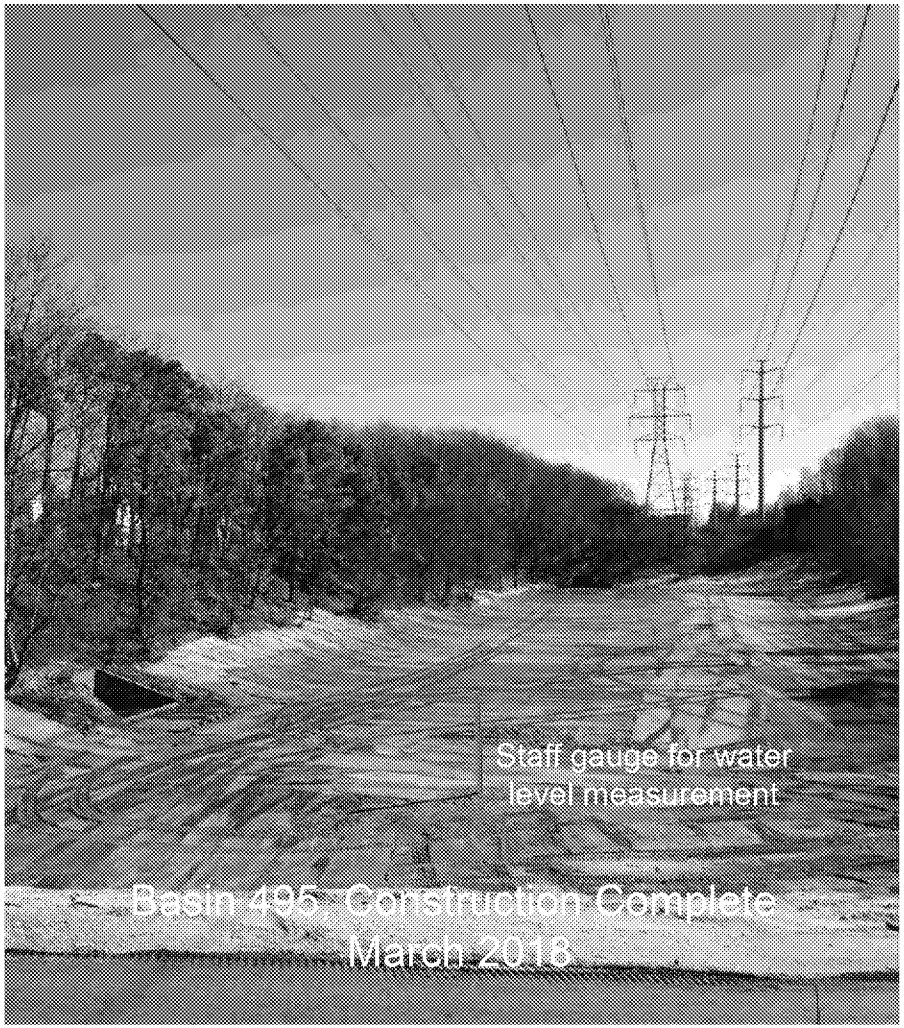
Basin 495, February 2018

Basin 495, February 2018

GM38 AREA HOTSPOT TREATMENT SYSTEM BASIN SCRAPING

- Final construction of basin inlet with new stone and staff gauge

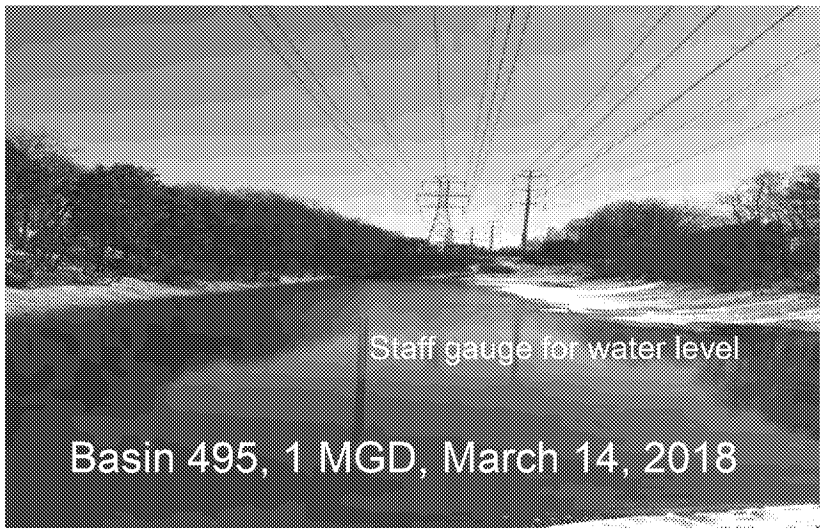
Basin 495, GM38 Inlet, March 2018



Basin 495, Construction Complete, March 2018

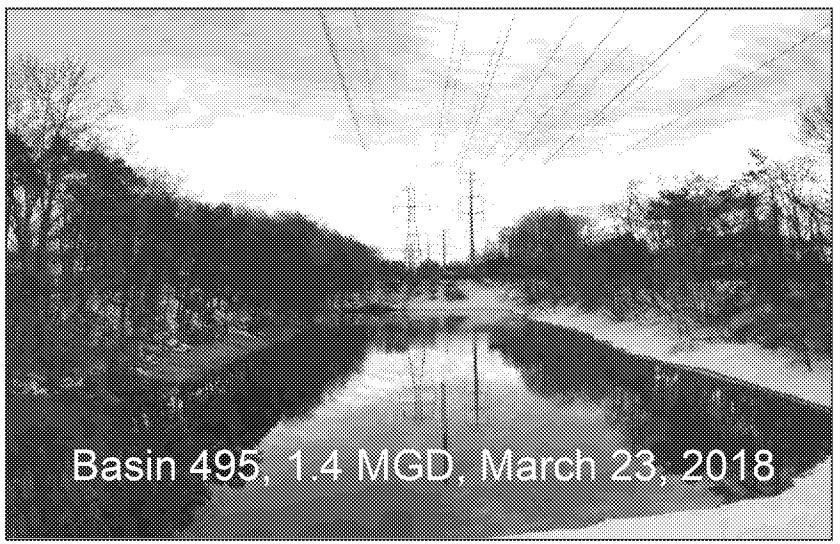
GM38 AREA HOTSPOT TREATMENT SYSTEM BASIN SCRAPING

- Basin water level after re-start of the GM38 Area Groundwater Treatment System
- Tracking water level in basin to help determine when maintenance may be required in the future



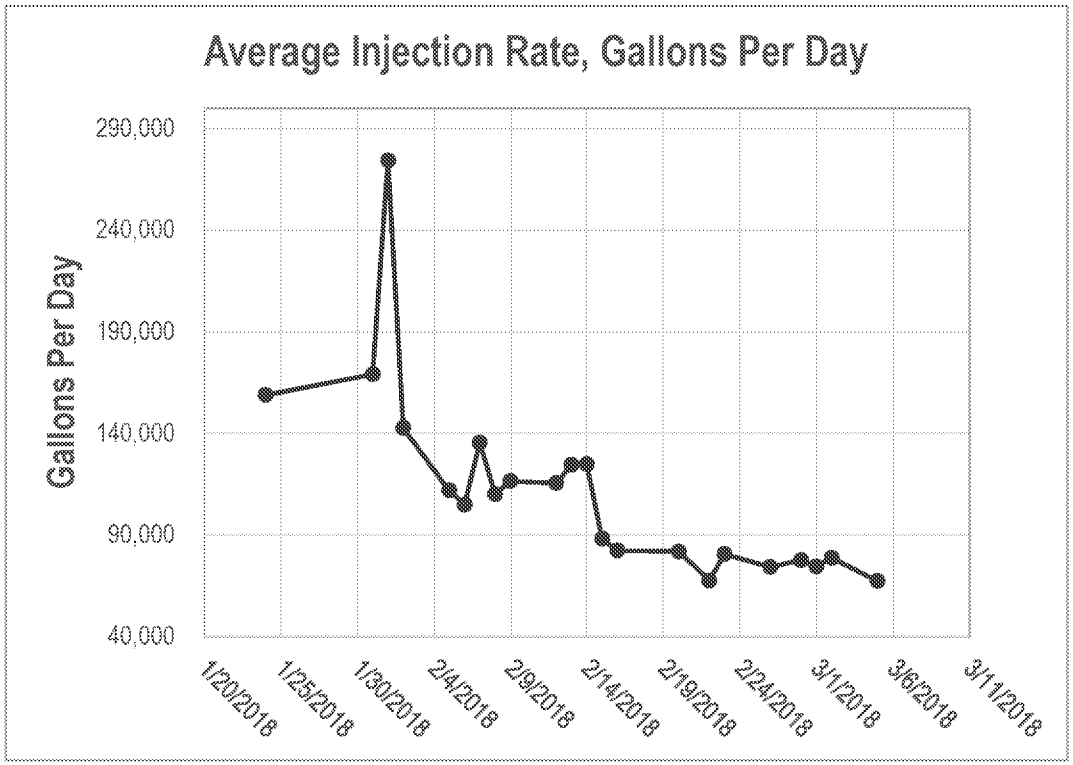
Basin 495, 1 MGD, March 14, 2018


Basin 495, 0.5 MGD, March 12, 2018


Basin 495, 1.4 MGD, March 23, 2018

GM38 AREA HOTSPOT TREATMENT SYSTEM INJECTION WELL TESTING

- During the outage while the basin was being scraped, the Navy evaluated the use of an existing Injection Well - IW 01 for discharge of treated water
- IW 01 is a 12-inch diameter well screened from 80 to 180 feet below ground surface
- Injection testing was conducted from January 24, 2018 to March 6, 2018
- 11 million gallons of treated water water was injected
- Due to fouling, average injection rate decreased from approximately 160,000 gallons per day to 75,000 gallons per day
- The design target long-term discharge rate is 500,000 gallons per day



GM38 AREA HOTSPOT TREATMENT SYSTEM INJECTION WELL TESTING SCHEDULE

- Path Forward:
  - –Re-develop injection well – Spring 2018
  - –Conduct injection testing – Spring 2018

RE108 AREA HOTSPOT TREATMENT SYSTEM

APRIL 2018 RESTORATION ADVISORY BOARD

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LONG ISLAND, NEW YORK

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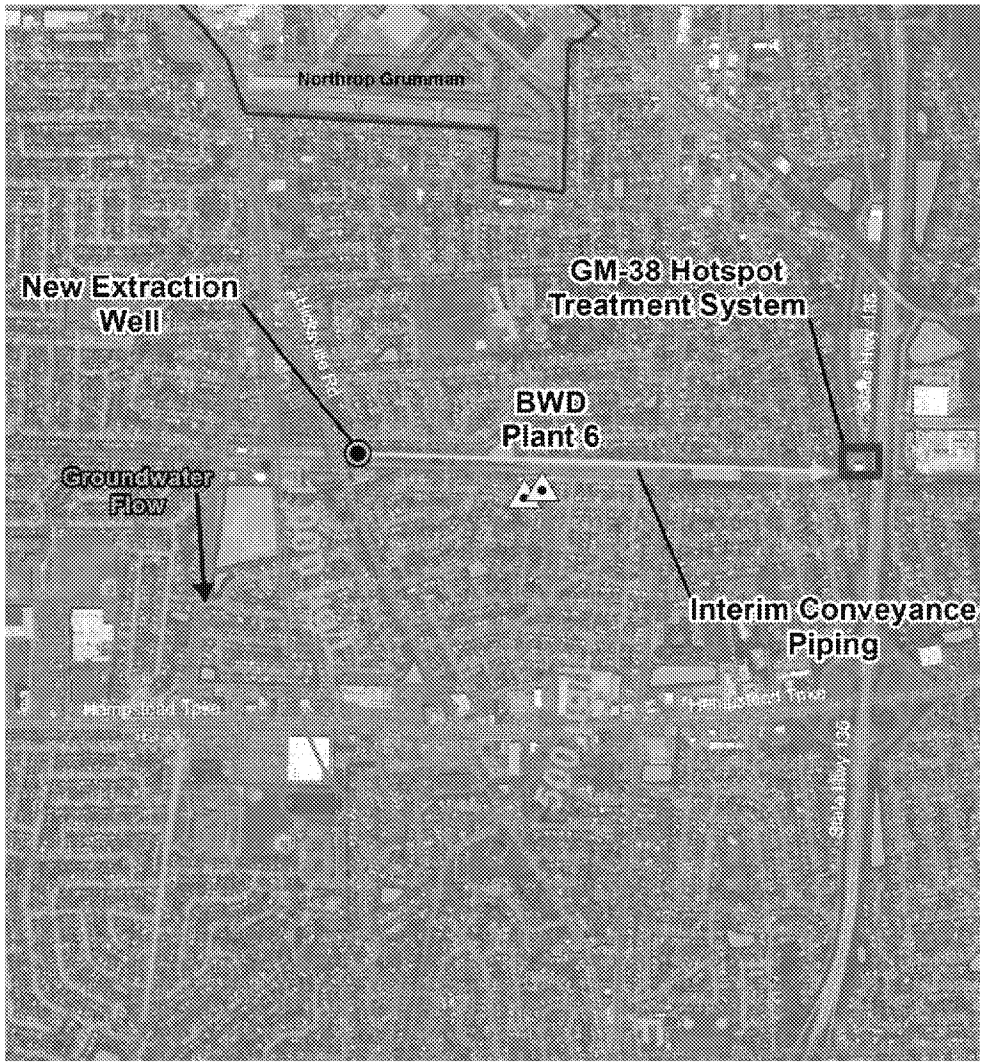
PHASE I RE108 AREA HOTSPOT TREATMENT SYSTEM

Phase I Status

- 30 Percent Design was completed in October 2017
- Phase I System will consist of an extraction well and double wall piping to the Navy's existing GM38 Area Hotspot Treatment System
- Extraction well will operate at 0.3 to 0.6 million gallons per day (MGD)
- Based on property access requirements, design and construction should be completed in 2018
- Extraction will reduce RE108 Area Hotspot groundwater migration rate and remove significant solvent mass from the groundwater
- Well operation will also accelerate overall groundwater cleanup



PHASE I RE108 AREA HOTSPOT TREATMENT SYSTEM


Utility Corridor, looking east


GM38 Area Hotspot Treatment System, looking southeast


GM38 Area Hotspot Treatment System, Air stripping tower, and liquid and vapor phase carbon

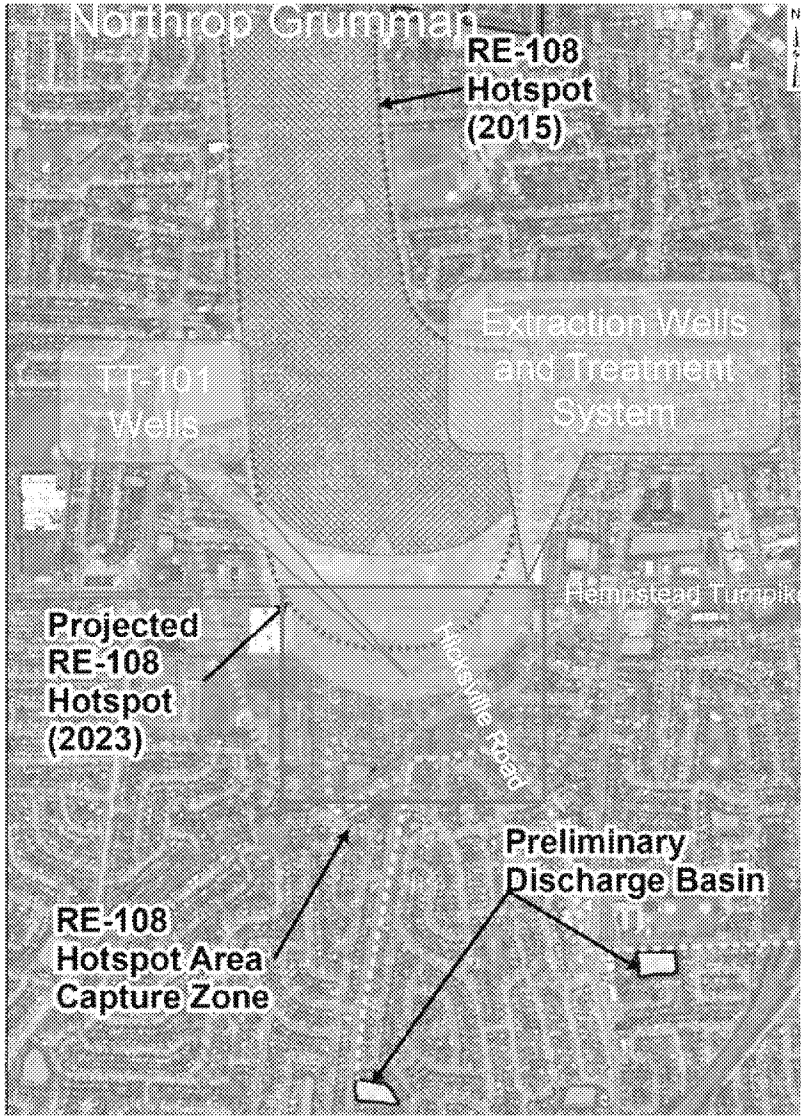
- The new well and piping will use the existing Town and Long Island Railroad utility corridor and GM38 Area Hotspot Treatment System

PHASE I RE108 AREA HOTSPOT TREATMENT SYSTEM SCHEDULE

- Apr 2017 – Initiated evaluation of Phase I System
- May 2017 – Started access discussions with Long Island Railroad (LIRR)
- Oct 2017 – Submitted Phase I 30 Percent Basis of Design Report to NYSDEC
- Nov 2017 – Requested non-intrusive and intrusive access agreements for LIRR
- Jan 2018 – Received NYSDEC comments on Basis of Design Report
- Feb 2018 – Received LIRR non-intrusive access agreement for surveying
- Jun 2018 – Finalize property access agreements
- Jun 2018 – Submit GM38 permit equivalent modification
- Aug 2018 – Finalize construction plans
- Sep 2018 – Start construction
- Dec 2018 – Finalize construction/start operation

PHASE II RE108 AREA HOTSPOT TREATMENT SYSTEM

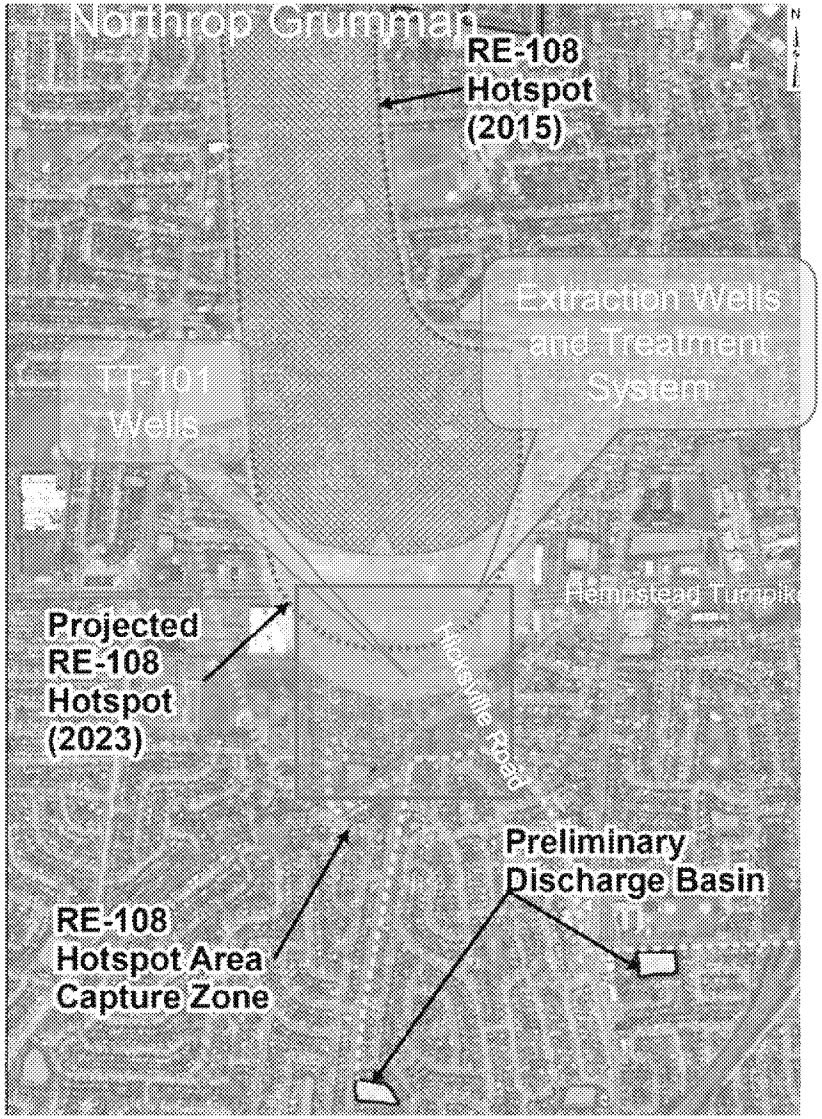
- Navy is designing a groundwater extraction, treatment, and discharge system to capture the RE108 Area Hotspot groundwater near the downgradient edge
- System is expected to extract 1.3 to 1.7 MGD of groundwater
- Air Stripping and Granular Activated Carbon (air and water) will be used
- Water will be treated to Drinking Water Standards
- The equipment and tanks will be enclosed in a building
- Buffers (minimum of 100 feet) to occupied structures will be used, 2 acres is required



PHASE II RE108 AREA HOTSPOT TREATMENT SYSTEM

Phase II Status

- Phase II 30 Percent Design is anticipated for spring 2018
- Other design activities including pilot-scale treatability testing and basin infiltration tests are being conducted
- Initial basin infiltration testing conducted in March 2018, long-term testing is underway
- Navy is actively pursing property access to construct the treatment system
- Property access will also be required for the extraction wells, conveyance piping, and discharge
- Groundwater is slowly moving to the south, therefore the location of the extraction and treatment system is based on the anticipated location of hotspot in 2022



PHASE II RE108 AREA HOTSPOT TREATMENT SYSTEM SCHEDULE

- Spring 2015 – Initiated design activities, including treatment requirements and location of extraction, treatment, and discharge properties
- Dec 2016 – Prepared preliminary design report
- Apr 2017 – Initiated property access requirements
- May 2017 – Conducted RE137 pumping test
- Mar 2018 – Conducted basin infiltration testing
- Apr 2018 – Submit Preliminary Basis of Design Report (BODR) to NYSDEC
- May 2018 – Receive NYSDEC comments on BODR
- Mar 2019 – Finalize property access agreements
- May 2019 – Finalize BODR
- Feb 2020 – Finalize surveying, 30, 60, and 90 percent Design and discharge requirements
- Apr 2020 – Finalize 100 percent design and discharge requirements
- Oct 2020 – Finalize Town, County, and State approvals
- May 2021 – Prepare Construction Remedial Action Work Plan
- Jul 2021 – Obtain construction permits
- Aug 2021 – Start construction
- Nov 2022 – Complete construction
- Dec 2022 – Start operation

OPERABLE UNIT 4 – SITE 1 FORMER DRUM MARSHALLING AREA CONTAMINATED SOIL, SOIL VAPOR, AND GROUNDATER

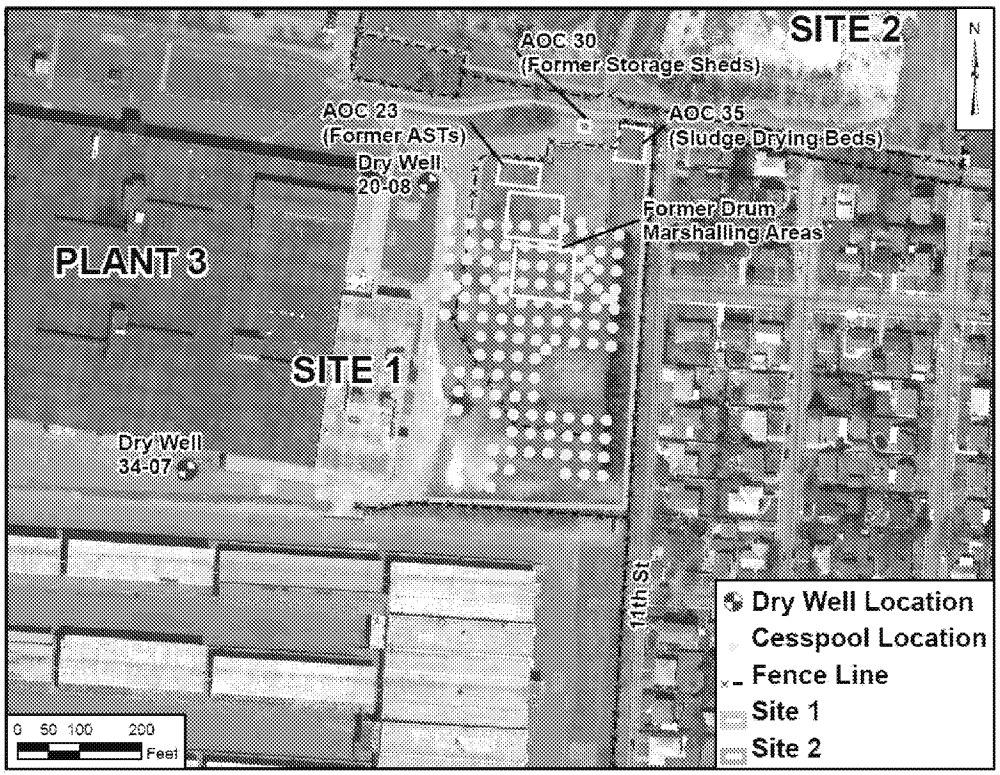
APRIL 2018 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHPAGE
LONG ISLAND, NEW YORK

04/18/2018

SITE 1 HISTORY

- Two former drum marshalling pads
- 120 abandoned cesspools for sanitary waters from Plant 3
- Drywells – Area of Concern (AOC) 34-07 and AOC 20-08 for storm water
- Soil contaminants: Polychlorinated biphenyls (PCBs), chlordane, polynuclear aromatic hydrocarbons (PAHs), and metals
- Groundwater contaminants: PCBs and chromium
- Soil Vapor (Vapor Intrusion) contaminants: Tetrachloroethene and trichloroethene

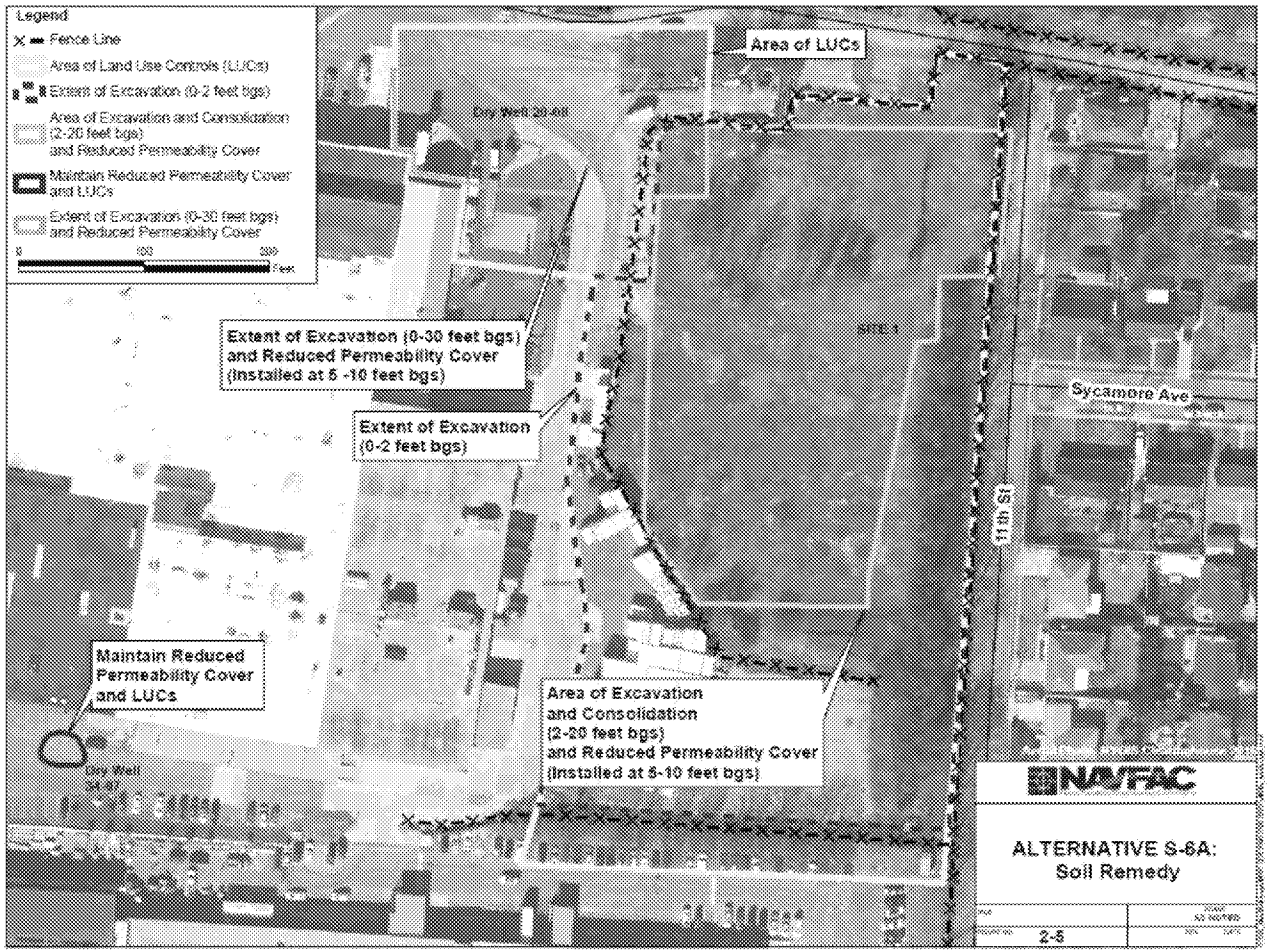


SITE 1 HISTORY

- Originally addressed under a 1993 Remedial Investigation, 1994 Feasibility Study, and 1995 Record of Decision
- Subsequent testing found that the extent of PCB-contaminated soil at Site 1 soil was more extensive than originally estimated
- Completed remedial actions include: Site 1 shallow groundwater and soil VOC remediation; and Sites 2 and 3 soil excavation, covering, and land use controls
- 2009/2010 Interim Action to address soil vapor intrusion
- 2012 Underground Storage Tank removal
- 2015 Remedial Investigation Addendum
- 2016/2017 Feasibility Study Addendum
- November 2017 Proposed Plan
- November 22, 2017 to January 22, 2018 Public Comment Period
- December 12, 2017 Public Meeting

SITE 1 HISTORY

- Proposed Remedy consists of soil excavation and offsite disposal and capping, groundwater monitoring, and enhanced soil vapor extraction



SITE 1 SCHEDULE

- 2018 Operable Unit 4 - Record of Decision (Spring)
- 2018 Site 1 Soil Remedial Design (Spring)
- 2018 Construction Planning Documents
- 2019 Start Field Construction